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### TREE DATURA DRUGS OF THE COLOMBIAN SIBUNDOY<sup>1</sup>

BY  
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IN southernmost Colombia high on the eastern flank of the Andean cordillera lies a small and isolated montane basin, the Valley of Sibundoy (Plate XLVIII). Several thousand Kamsá-speaking Sibundoy and three Inga-speaking groups have inhabited the Valley for several centuries, perhaps for much longer.<sup>3</sup> The collapsing agricultural terraces clearly visible at many places on the valley sides indicate a populous pre-hispanic occupation, and the Sibundoy believe that their ancestors have lived in the Valley from very early times. As yet, however, there is no evidence linking the early terrace builders with the Sibundoy or with any other native group in southern Colombia.

Despite the apparent isolation of the Valley of Sibundoy, the natives have probably always been in contact with a diversity of other aboriginals. Today, as in the Sixteenth Century, there are three trails leading out of the Valley to the east, west and north. Two of these have recently been supplanted, for a road now connects the highland capital of Pasto twenty miles to the west

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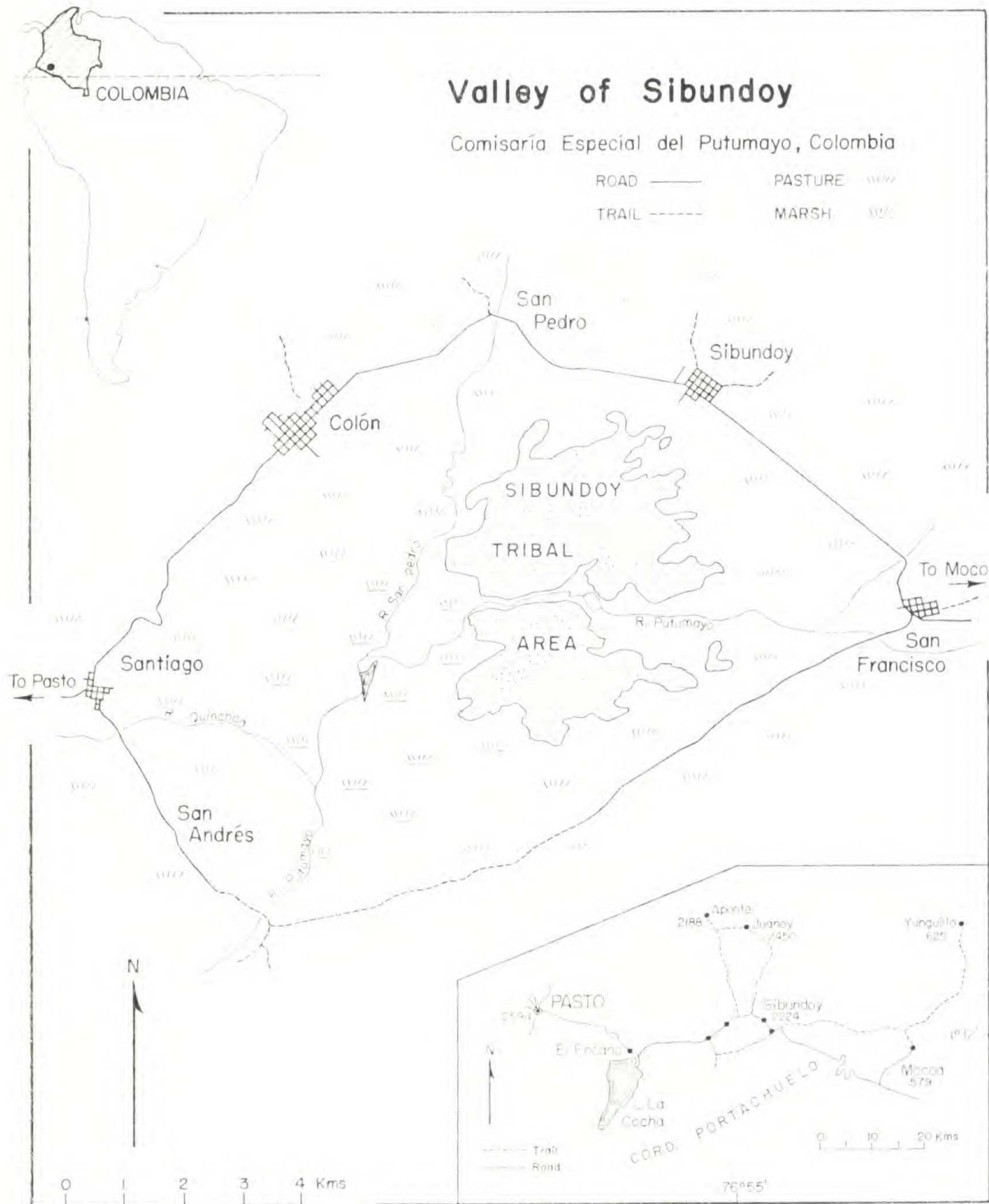
<sup>3</sup> Inga is one of the northernmost Quechua dialects (9, 24).

with Mocoa in the eastern lowlands. The third, and shortest trail, connecting the Valley with the Río Juanambú drainage to the north, is probably little changed from 1801 when Humboldt and Bonpland traversed it twice, or from 1541 when Hernán Pérez de Quesada fled homeward along it from his wretched search for El Dorado.

During the long period of relative isolation, a great variety of curious cultivated plants were brought into the Valley. Some are of scant importance today and may never have enjoyed a wide appreciation among the Valley's inhabitants. Others, the predominant food, medicinal and narcotic plants, have come to assume very great importance in the economic and social life of the natives. Certain plants, known nowhere else, have evolved in the Valley under the influences of cultivation. Such has come to pass with the tree *Datura* drugs.

The genus *Datura* consists of eight to twelve herbaceous species (2, 3, 28), with their centre of diversity in Mexico and southwestern United States; and three or more (7) to fourteen (28) arborescent species centered in the northern Andes. In the absence of a modern and comprehensive revision of the genus, Safford's account of 1921 has been widely accepted. However, were we to continue employing his species concept today, the diversity of herbarium material available now would allow us to define thirty or more "species" of tree *Daturas* (sect. *Brugmansia*) alone. Recently, I have pointed out that almost all tree *Daturas* belong to one of three species and that the few remaining plants are probably hybrid or aberrant individuals (7). The variability expressed in the tree *Daturas* as a group has been enhanced through their cultivation by many native peoples; in fact, their absence from any natural vegetation implies that their recent evolution has taken place entirely under man's influences.

PLATE XLVIII



Valley of Sibundoy, showing the area inhabited today by the Sibundoy Indians. (Areas at the western and southwestern margins of the Valley inhabited by Colón, Santiagueño and Sanandreseño Indians are omitted.)

In the Valley of Sibundoy, most of the *Daturas* belong to the species *Datura candida* (Pers.) Saff., though *D. sanguinea* R. & P. is also present. They are much planted by the natives for ornament in hedge rows, in house yards and in the multi-purpose gardens; and the abundance of huge, white flowers which appear four times annually make them the principal visual focal point everywhere. Containing atropine and hyoscyamine, these *borracheras* ('inebriants') have been used variously by the natives both as psychotropic and medicinal preparations. While one of the cultivars, 'Buyés', is frequently seen throughout the inhabited parts of the Valley, most of the cultivars are encountered only very infrequently. So far as I am aware, the unique *Daturas* of the Valley were not known to outsiders until Hernándo García-Barriga found them in 1935.

Frequent suggestions that the Sibundoy tree *Daturas* are infected by viruses has focused attention on this as a major cause of the peculiar leaves by which several of the cultivars are recognized (3, 22, 35, 36). However, early in the course of my thirteen months of observations in the Valley in 1962-63, I realized that each cultivar is genetically distinct, quite apart from the possible influence of viruses on the leaves. Differences among the cultivars which I believe to be genetic lie in the morphology of the flowers and fruit, in the incidence of chromosomal inversions and in the amount of aborted pollen. Some of the unique leaves are also reflections of genetic uniqueness and not of virus infection. In recognition of ethnomedical, pharmacologic, chemical and phytopathologic interest in the Sibundoy tree *Daturas*, an important objective of my study has been to understand their morphologic and cytologic variability, to distinguish among them, and to define them.

### *Variation in Datura candida 'Buyés'*

Most specimens of *Daturas* in the Valley of Sibundoy are called *buyés borrachera* by the Kamsá-speaking Sibundoy, or *D. candida* cv. *Buyés* as described below. They represent several, or possibly many, genetic lines, as evidenced by marked differences in the size and shape of the flowers. At the present time, however, the natives are little, if at all, aware of these variations, and they do not discriminate verbally within their concept of *buyés borrachera*. For later purposes of comparison, it will be helpful here to record the limits of variation of *D. candida* 'Buyés' in the Valley of Sibundoy. To this end, a representative sample of leaves and flowers was taken from twenty-eight trees scattered throughout the area of the Valley inhabited by the Sibundoy. With the addition of other collections, there are thirty-seven trees represented, to give an indication of the range of variability of this cultivar. Table I gives the range of variation in *D. candida* 'Buyés' for six of the eight characters found to be most useful in distinguishing the nine Sibundoy cultivars of *D. candida*.

TABLE I. Range of variation in *D. candida* 'Buyés' (meas. in mm.).

		median
Leaf ratio (W/L)	.346-.577	.460
Calyx length	85- 161	128
Corolla length	196- 293	252
Stamen length (including the adnation of filament to corolla)	132- 199	165
Anther length	30- 41	35
Pistil length	143- 212	175

The most conspicuous feature of these trees is certainly the brilliant white corolla, but despite this, its variation in size has no formal recognition among the Sibundoy. In many flowers, the edge of the corolla between the lobes is emarginate, but in some it is straight or well

rounded. Counts of aborted pollen in six plants ranged from 20.7 to 80.4 per cent.

*D. candida* 'Buyés' is scarcely distinguishable from many examples of *D. candida* in widely separated areas of tropical America. In the characters studied, its range of variation is less than that of the species as a whole. The rare Sibundoy cultivars of this species have never been found outside of the Valley of Sibundoy, and it is my assumption that they are all derived, at least in part, from *D. candida* 'Buyés'.<sup>4</sup>

#### *Chromosome numbers*

Heiser (16) found the chromosome number of *D. candida* as represented by the collection *Heiser 6119* (IND), to be  $n=12$ , and Barclay (2, 3) found  $2n=24$  in *D. candida* 'Culebra' (Barclay & Schultes 286) and in *D. vulcanicola* A.S. Barclay.

Preparation of aceto-carmin stained microspore mother cells permitted observation of the chromosomes after 48–72 hours. The chromosome counts for each cultivar were made on either one or two plants as indicated by the voucher collection numbers in Table II. Seven of the nine *D. candida* cultivars were examined, and all were seen to have a chromosome complement of  $n=12$ . All counts were made after metaphase I, most at or following metaphase II. The data are summarized in Table II. Figure 1a, illustrates the chromosomes of *D. candida* 'Culebra'.

Twelve is the haploid chromosome number of *Datura sanguinea* R. & P. (7, 16), of "*D. suaveolens*" (15), and of all the herbaceous species of *Datura* (1).

<sup>4</sup>I recently encountered a tree referable to *D. candida* 'Amarón' near Las Cruces in southernmost Nariño. Thus the question is raised as to whether this was brought from the Valley of Sibundoy, or whether it is part of an early population of plants from which one or more of the Sibundoy cultivars might have originated.

PLATE XLIX



*Datura candida* (Pers.) Saff. cv. Buyés. (Upper) A massive display of flowers. (Lower) Habit of the tree, growing in a cornfield.

TABLE II. Chromosome numbers of *D. candida* cultivars.

Cultivar	No. of cells during microsporogenesis with				Voucher collection*
	n=10	n=11	n=12	n=13	
'Buyés'	1	2	137	3	1117, 1266
'Ocre'	—	5	57	—	1267
'Biangán'	1	3	43	—	1431
'Amarón'	—	—	22	1	564
'Quinde'	1	1	30	—	1304, 1433
'Munchira'	1	3	46	1	1268
'Culebra'	—	6	122	5	1112, 1400

\* On deposit at the Economic Herbarium of Oakes Ames, Harvard University, and the United States National Herbarium.

### *Anaphase bridges*

In four cultivars of *D. candida*, the frequency of anaphase I bridges in pollen mother cells was recorded. The formation of the anaphase bridge leads to uneven distri-

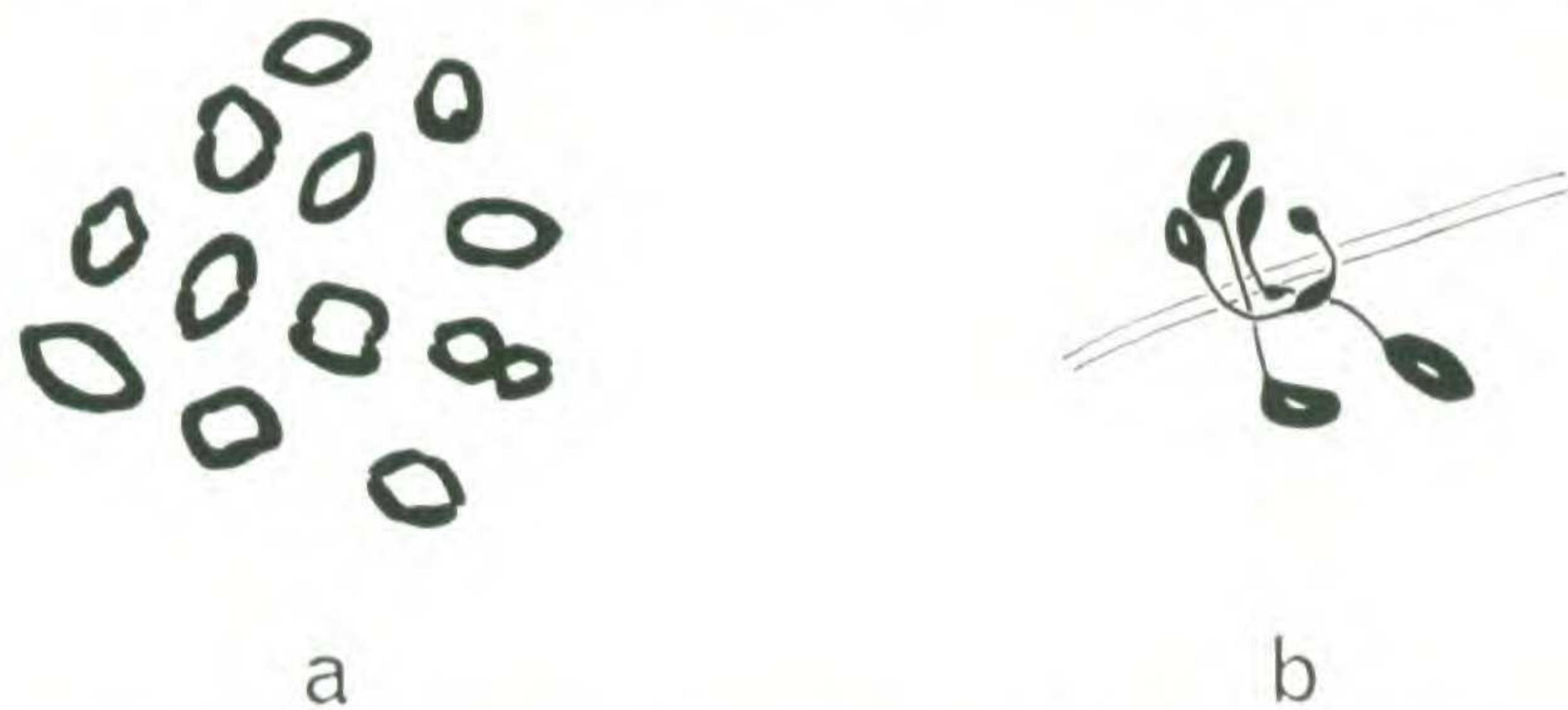


FIGURE 1. Chromosomes of *D. candida* 'Culebra'. (a) Metaphase I ( $\times 500$ ). (b) Anaphase II bridges ( $\times 2000$ ).

bution of chromosomal material between the first division meiotic products and to consequent imbalance in the four resulting microspores. Table III summarizes the data and includes frequencies of pollen abortion from Table IV for comparison.

In 'Ocre', no pollen mother cells were seen with more than one anaphase I bridge. 'Buyés' plants showed PMC's with one to four bridges, while in 'Culebra' there were up to nine bridges between first division nuclei. Figure 1b, illustrates an occurrence of anaphase



TABLE III. Anaphase I bridges formed during microsporogenesis in *D. candida* cultivars.

Cultivar	Total PMC's observed	No. PMC's with A I bridges	% PMC's with A I bridges	observed % abnormal pollen
'Buyés'	213	35	16.4	78.1*
'Ocre'	358	64	17.9	50.8
'Amarón'	1000	30	3.0	32.8
'Culebra'	537	97	16.9	83.3

\* 'Buyés' trees *e* and *f* only.

bridges in 'Culebra'. The chromosomal irregularities leading to the formation of anaphase bridges are unknown. In many cases the bridges were accompanied by one or more fragments, implying that chromosomal inversions are responsible for some, but not all of the observed bridges.

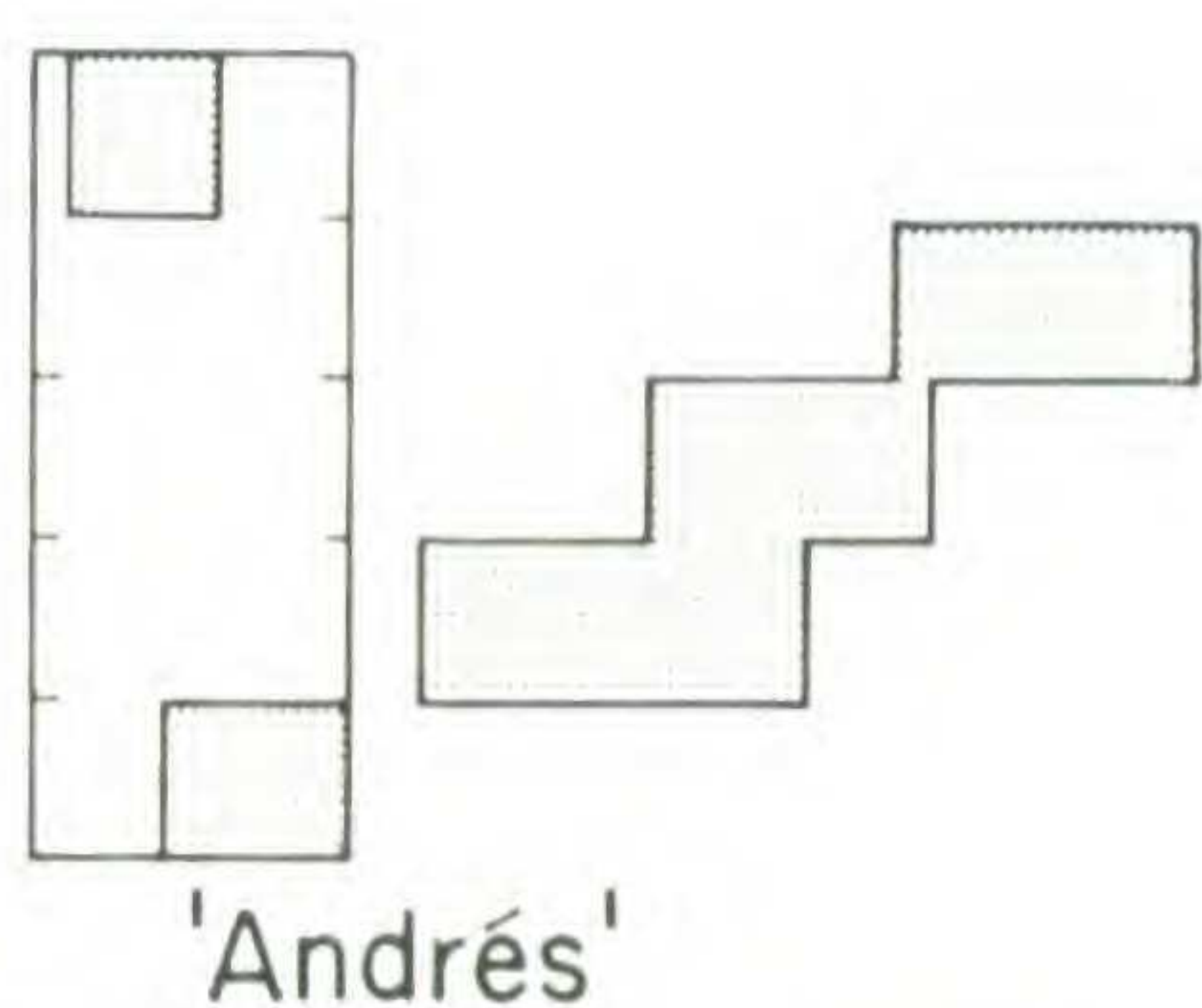
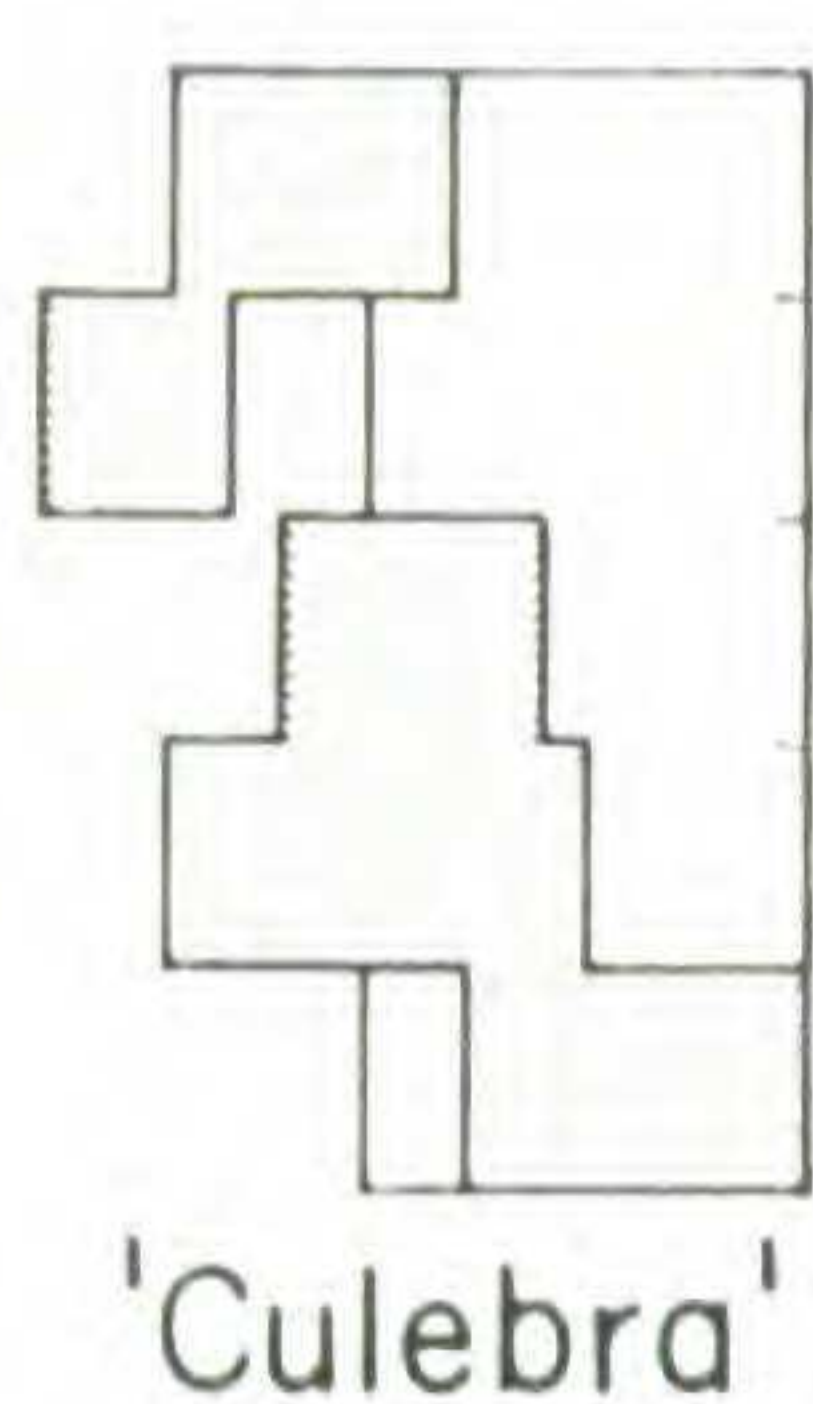
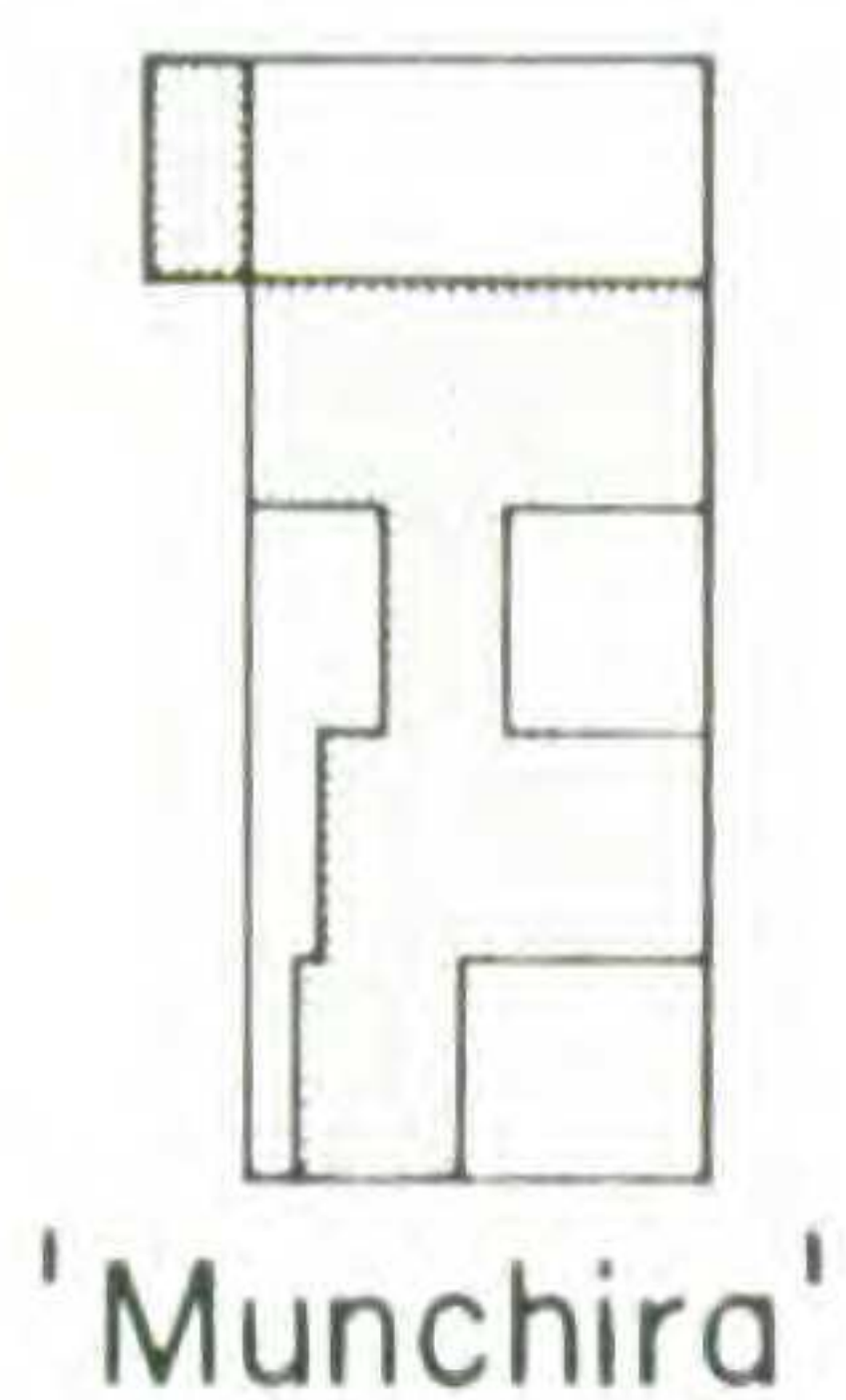
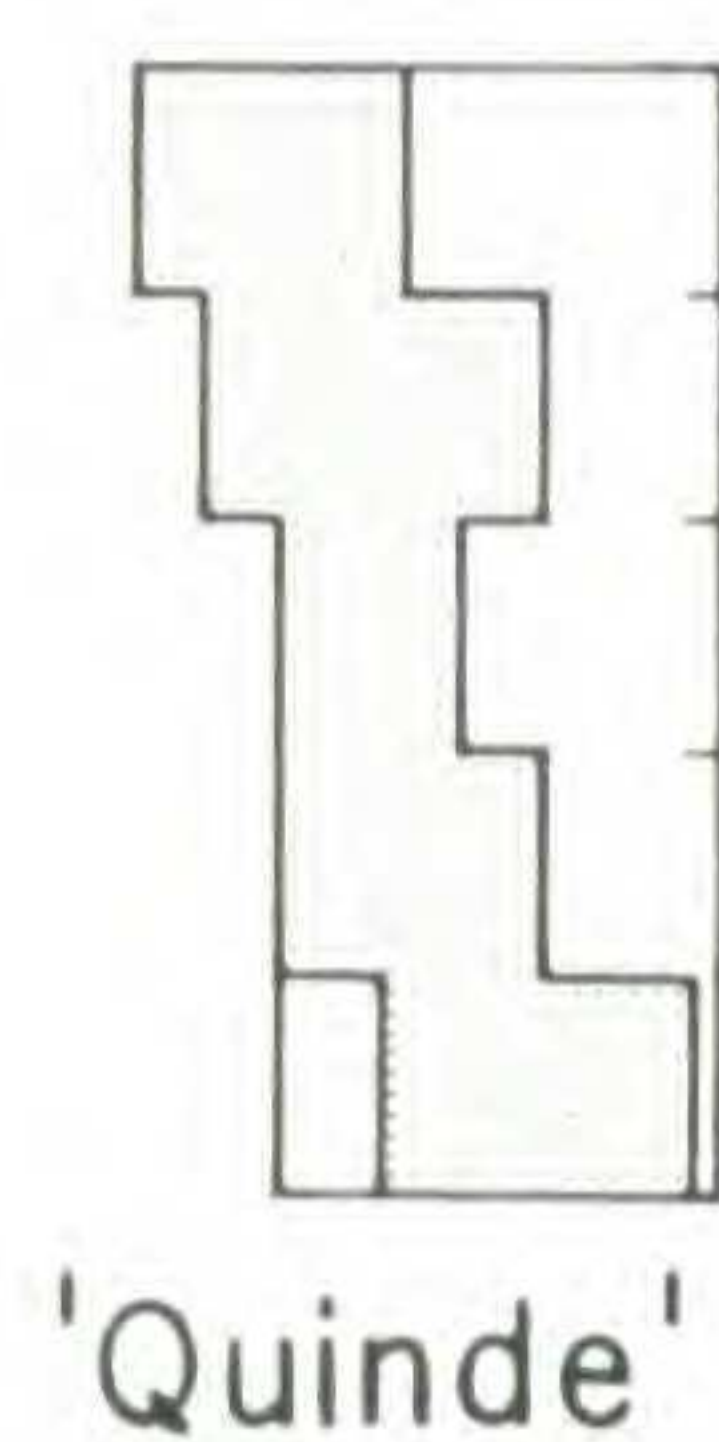
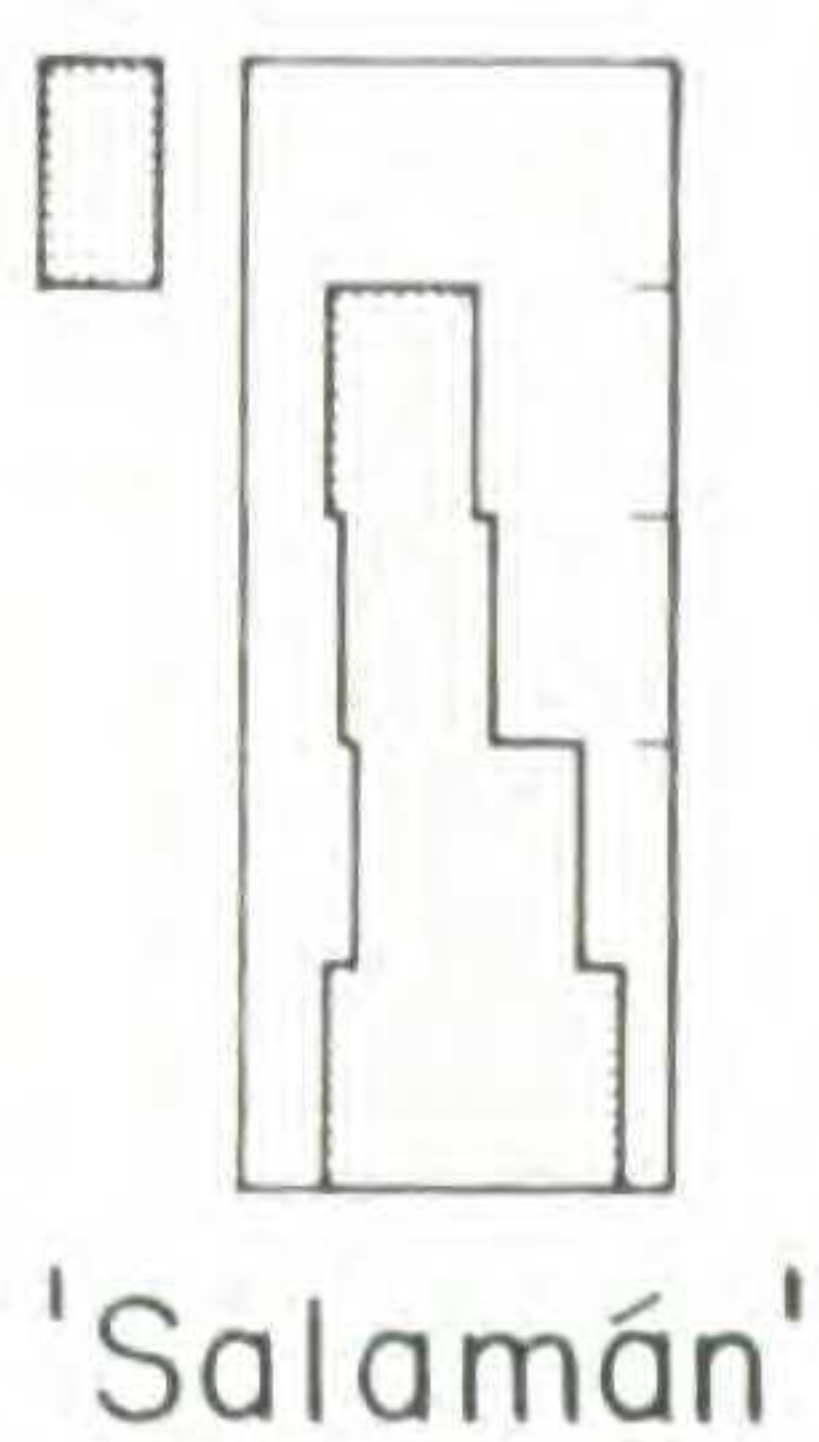
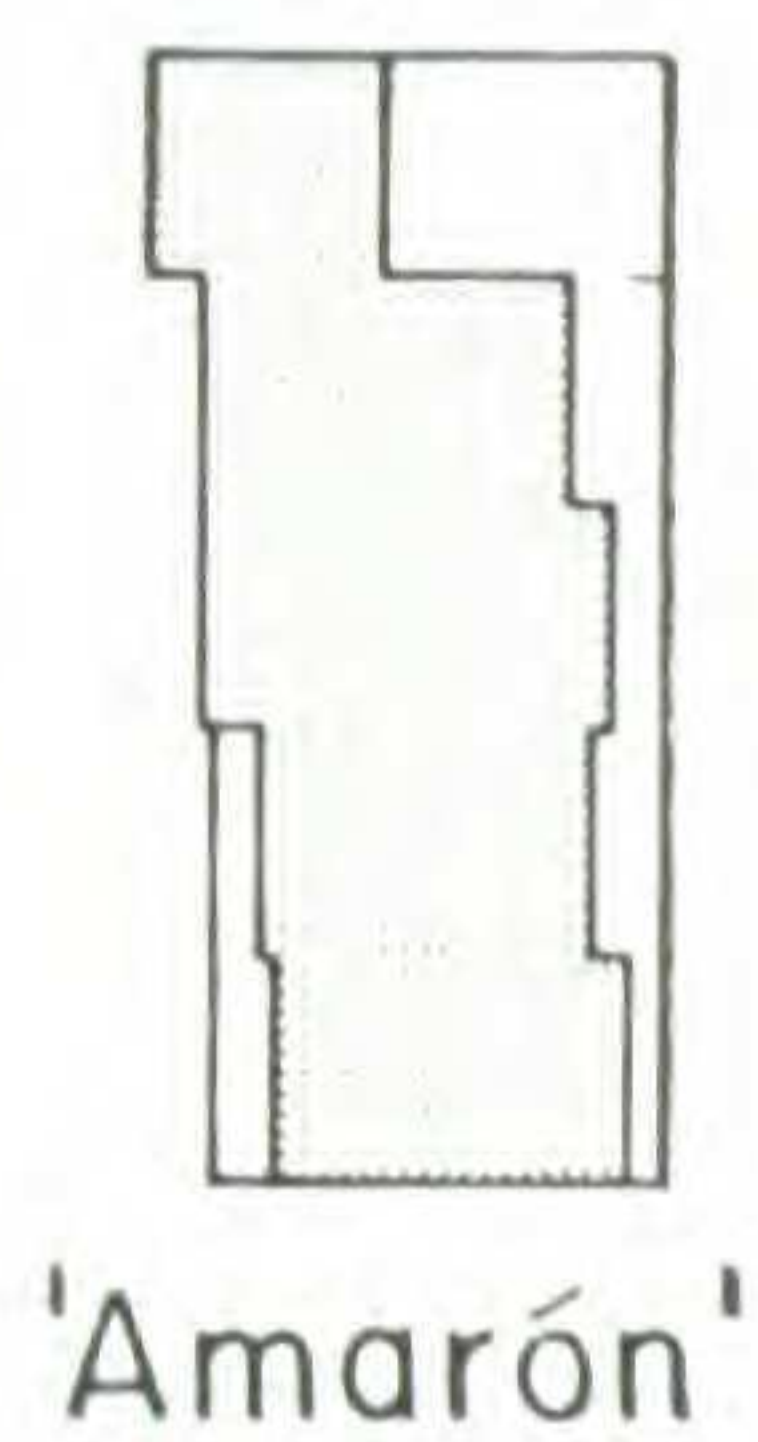
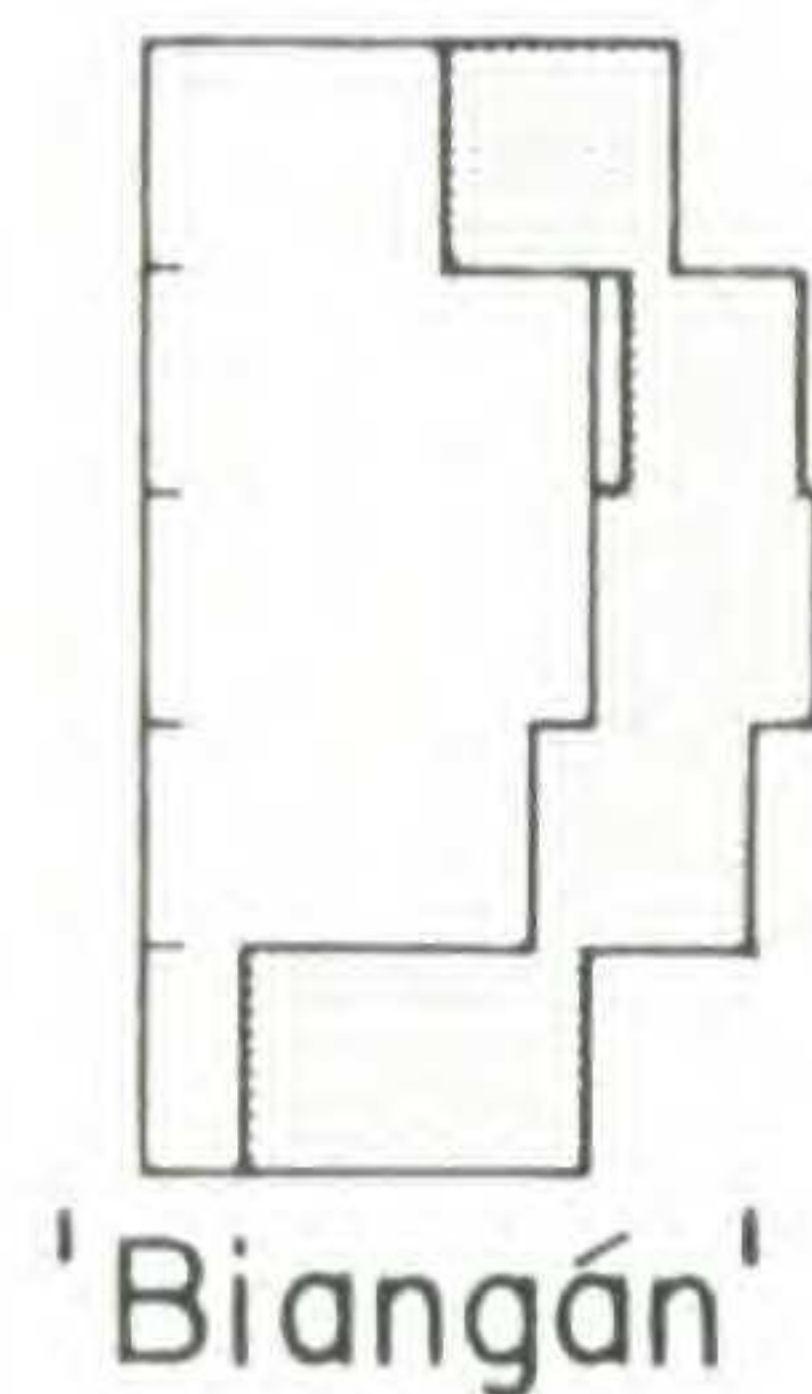
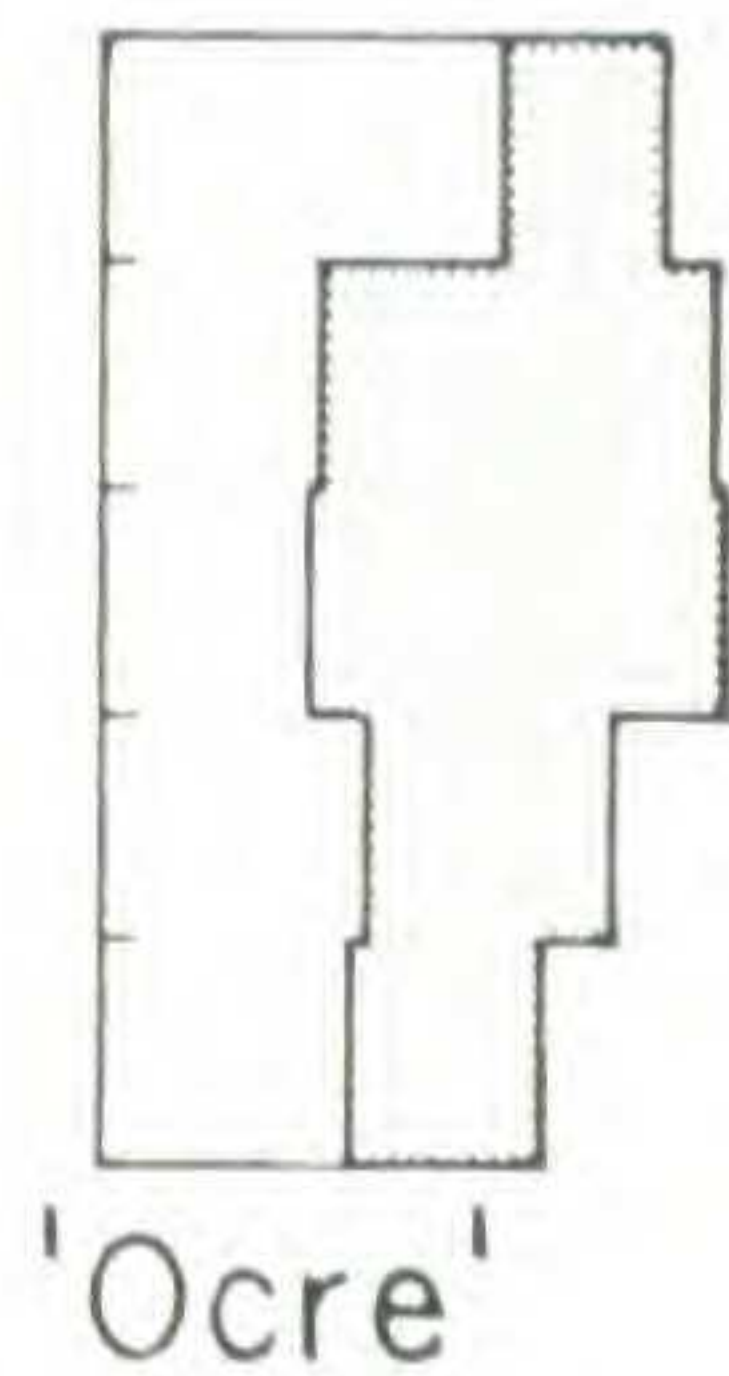
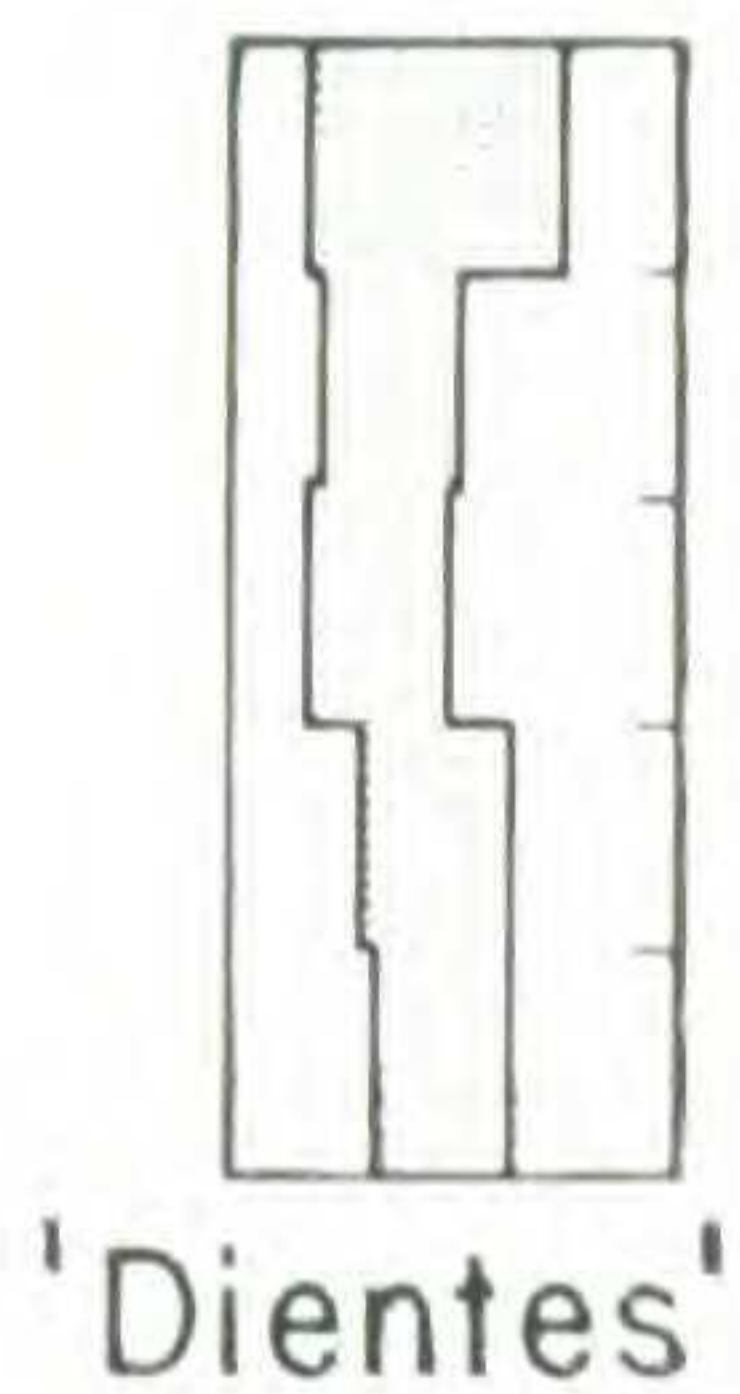
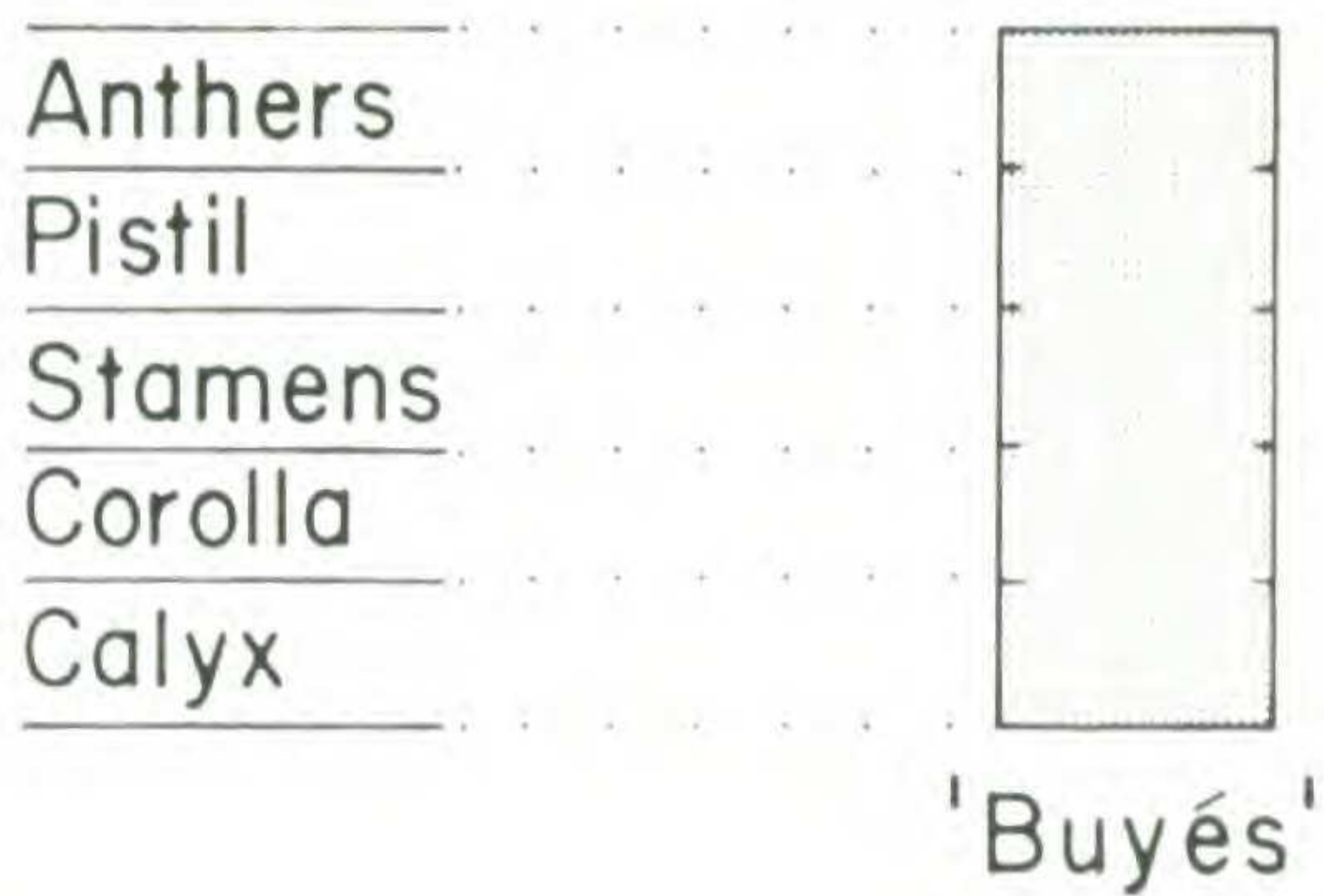
#### *Pollen abortion*

Preliminary examination of the pollen of *D. candida* 'Culebra' disclosed a predominance of small, either spherical or misshapen, spores among the large and well sculptured ones. I decided to investigate for comparative purposes the frequencies of such abnormal pollen in all of the *D. candida* cultivars. In all but two cases, a minimum of two widely separated trees was examined, one by myself and one by an assistant. The results of these examinations are recorded in Table IV.

It can be seen that the production of abnormal pollen ranges from a low of 5.7 per cent in 'Dientes' to a high of 83.3 per cent in 'Culebra'. As had been thought from purely morphological evidence, the cultivars 'Buyés' and 'Dientes' do not consist of a single clone each; with both groups there are widely differing capacities to produce normal pollen.

Some of the abnormal pollen may be accounted for by the inequality of meiotic products resulting from ana-

PLATE L



Ranges of variation in the lengths of five floral parts of *Datura* cultivars compared with the respective ranges of variation in *D. candida* 'Buyés'. The values for 'Buyés', from Table I, are standardized to a common size in the uppermost ideogram, and values for the other cultivars (cf. taxonomic treatment) are expressed in proportion to these.

TABLE IV. Frequencies of abnormal pollen in *D. candida* cultivars.

Cultivar	Tree	Total pollen observed		abnormal pollen		% abnormal pollen
'Buyés'	<i>a</i>	500		142		
	<i>b</i>	270	770	56	198	25.7
	<i>c</i>	500		208		
	<i>d</i>	500	1000	216	424	42.4
	<i>e</i>	700		535		
	<i>f</i>	500	1200	402	937	78.1
'Dientes'	<i>a</i>	700		39		
	<i>b</i>	529		29		
	<i>c</i>	500	1729	30	98	5.7
	<i>d</i>	500			129	25.8
	<i>e</i>	518			176	34.0
No. 1111	<i>a</i>	600		260		43.3
'Ocre'	<i>a</i>	608		308		
	<i>b</i>	500	1108	255	563	50.8
'Biangán'	<i>a</i>	800		472		
	<i>b</i>	564		370		
	<i>c</i>	500	1864	299	1141	61.2
'Amarón'	<i>a</i>	764		225		
	<i>b</i>	700	1464	255	480	32.8
'Salamán'	<i>a</i>		1546		173	11.2
'Quinde'	<i>a</i>	594		175		
	<i>b</i>	500		211		
	<i>c</i>	500		199		
	<i>d</i>	500	2094	180	765	36.5
'Munchira'	<i>a</i>		500		291	58.2
'Culebra'	<i>a</i>	615		506		
	<i>b</i>	490		416		
	<i>c</i>	250	1355	207	1129	83.3

phase bridges as noted above in Table III. The remainder might well be caused by the presence of genetic factors for pollen abortion; Blakeslee and his co-workers found thirty such factors in their extensive cultures of herbaceous *Daturas* (1).

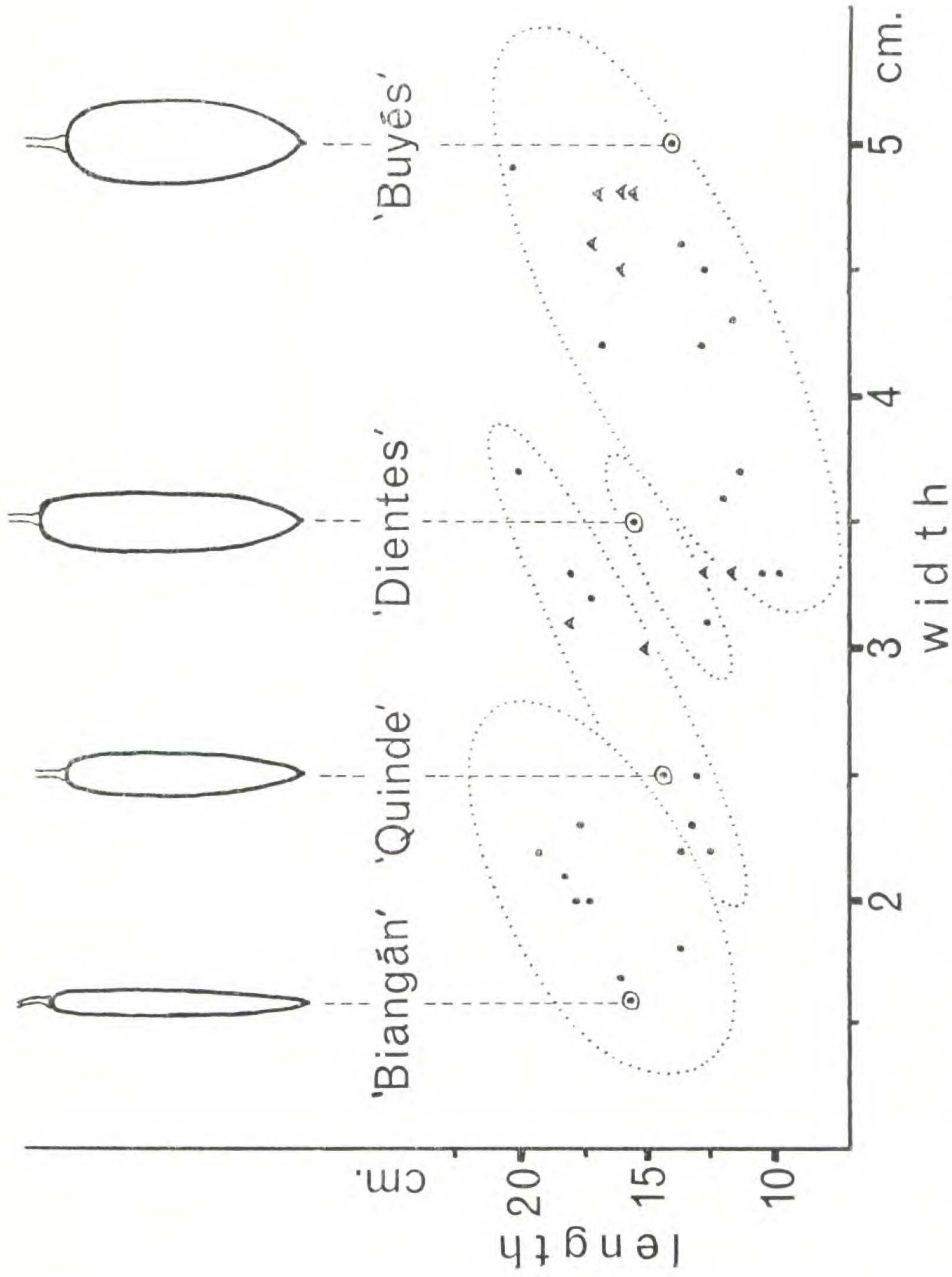
#### *Flower variation among the Datura candida cultivars*

All of the cultivars have markedly similar flowers, with the exception of the bizarre 'Culebra' which is discussed later. Nevertheless, each displays a distinctive range of variation in the length of the several floral parts. Plate L compares nine of the cultivars according to the lengths of five of their floral parts. It is evident that with but few exceptions the ranges of variation of each cultivar are either wholly within, or largely overlapping, those of *D. candida* 'Buyés'. This strongly suggests that most of the cultivars were selected from the large and variable population of *D. candida* 'Buyés'. It further suggests that the Sibundoy did not select and propagate new forms (cultivars) characterized by floral differences, but, as we shall see below, they selected leaf differences for preferential maintenance as clones.

#### *Fruit variation*

Most of the fruits found in prolonged searching throughout the Valley were on 'Buyés' and 'Amarón' trees which are by far the most numerous. Some fruits were also seen and collected on 'Dientes', 'Quinde' and 'Biangán' trees; the remainder of the *D. candida* cultivars are believed by the natives never to form fruit. The indehiscent fruits eventually dry up, and the pericarp disintegrates slowly; but the seeds are not released, and the dried fruit often remains on the tree for several months. Plate LI shows the variation in fruit size and shape among the five cultivars known (however rarely)

PLATE LI



Fruit variation in *D. candida* cultivars. The fruits, shown  $\frac{1}{4}$  natural size, are from the following collections: 1162 ('Biangán'), 1121 ('Quinde'), 1447 ('Dientes') and 1117a ('Buyés'). A—'Amarón', see text for explanation.

to produce fruit. Most of the nine 'Amarón' fruits collected fall within the 'Buyés' variation pattern; two are the same as 'Quinde'. A single 'Buyés' tree (*Bristol 1109, 1193*) has unusually long (11.7–24.7 cm.), more narrow fruits which are not included in Plate LI. Measurements were made on ripe fleshy fruits.

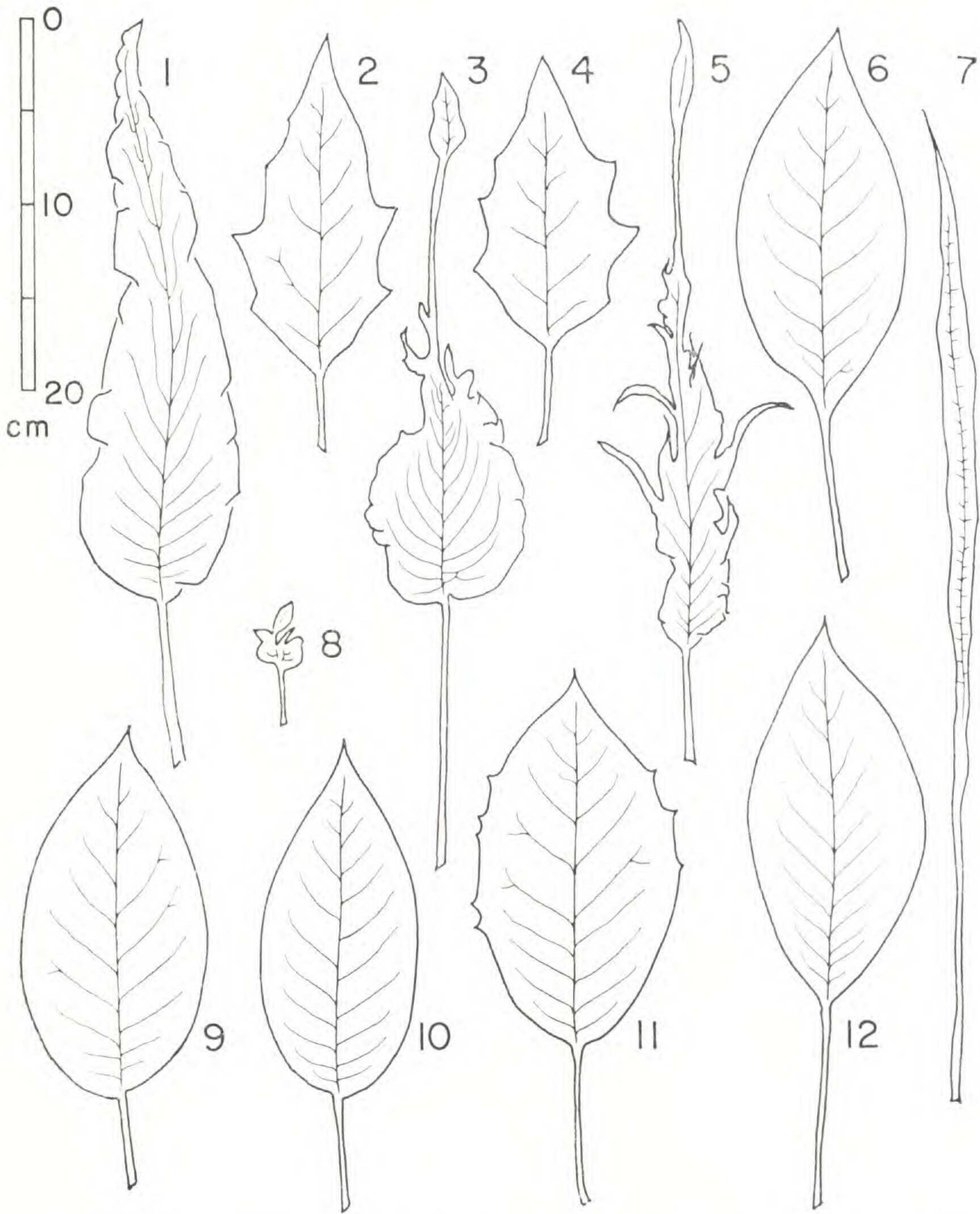
### *Leaf variation*

Despite the highly conspicuous and attractive flowers of all the cultivars, the leaves are the centre of interest to the natives, to whom they are the structures of principal economic importance. Plate LII depicts a representative leaf of each cultivar. The striking malformation in four of the cultivars has led to statements that the plants are diseased, probably by viruses, or that they are " 'virus-races' " (3, 22, 35, 36).

Recently, Robert Kahn and R. Bartels have isolated a previously unknown virus from several of the cultivars, including 'Buyés' which never has erose or otherwise malformed leaves (21). These investigators have named the virus Colombia Datura Virus (CDV) and report that its symptoms in *Datura* are leaf distortion, mottling or yellowing, but that sometimes there are no symptoms. Leaves of the common *D. candida* 'Buyés' in the Valley of Sibundoy are never distorted, and mottling and yellowing, if present, are rare.

It seems probable that there is no direct causative relationship between CDV and leaf shape in the *D. candida* cultivars. At the same time, the genetic control of leaf shape is enigmatic, for careful examination of the irregularly leaved cultivars will disclose on every plant a few small to medium sized ovate and entire leaves, as in 'Buyés'. These leaves invariably occur on one or two branches which are growing more rapidly than all others on the plant. Given this exception, it is tempting to pos-

PLATE LII



Representative leaves of all Sibundoy *Datura* cultivars, with collection numbers indicated: 1, 'Amarón', 564; 2, 'Guamuco', 1420; 3, 'Salamán', 1432; 4, 'Sangre', 1309; 5, 'Quinde', 1333; 6, 'Andrés', 1314; 7, 'Culebra', 1112; 8, 'Munchira', 1268; 9, 'Buyés', 1388; 10, 'Biangán', 890; 11, 'Dientes', 1447; 12, 'Ocre', 1267.

tulate that the highly irregular formation of the leaves is caused by a critical concentration of a diffusible substance, and that in the exceptional cases of very vigorously growing stem apices the critical level of concentration is not reached. Such a substance might be viral or hormonal in nature. That the natives find the smallest, most malformed leaves the most toxic suggests that even the tropane alkaloids should not be ruled out of consideration as possible inhibitors of regular leaf development. As Robert Kahn has suggested to me, grafting experiments should help to clarify the development of the various leaf shapes.

### *Seedlings*

Through thirteen months of constant observation of the *Datura* cultivars in the Valley of Sibundoy, no seedling tree was seen. It has been possible, however, to grow healthy seedlings of three clones, 'Buyés', 'Amarón' and 'Quinde', in the greenhouses of the Biological Laboratories of Harvard University. The seedlings within each cultivar are not uniform. Seeds collected from *D. candida* 'Quinde' trees have produced seedlings the leaves of which resemble 'Dientes' (1596, 1611; ECON) as well as 'Quinde' (1607; ECON). Seedling variation from a single 'Quinde' fruit includes both 'Quinde' and 'Dientes' types (1608; ECON), suggesting that a 'Dientes' tree may have been the pollen parent.

'Quinde' seedlings exhibit the same failure to form 'Quinde'-type leaves on a very vigorously growing stem that was observed on mature trees in the Valley of Sibundoy. As the growth rate of the seedlings slows somewhat, these same stems that grew vigorously produce typical 'Quinde'-type leaves. Assays of these seed grown 'Quinde'-type leaves for the presence of mechanically transmittable virus by Robert Kahn (pers. comm.) have



been negative, as would ordinarily be expected. Thus the formation of 'Quinde'-type leaves by apparently healthy seedlings implies that the typical leaves of 'Quinde' trees are formed independently of the virus (CDV) infecting them.

One may compare the successive occurrence of differently shaped leaves to the widely encountered phenomenon of juvenility, but in so doing it must be noted that only four of the *D. candida* cultivars are involved, while the other five are not. I have not seen any descriptions of juvenile leaves in the genus *Datura*.

Blakeslee found a variant of *D. Stramonium* with a leaf similar but not identical to that of 'Quinde' (1). He named these 'Quercina' and soon established that their unusual leaf shape depended upon a single recessive gene. Curiously, he also discovered that the juices of the plant would transmit the characteristic to normal *D. Stramonium*, and he believed that the Quercina effect was caused both by a gene and by a virus. Further studies of the supposed virus have not been undertaken to my knowledge.

#### *Geographical centre of diversity*

More variation in *Datura candida* is found in the Valley of Sibundoy than is known at any other locality. Such a centre of diversity in an isolated valley apparently inhabited by ancient agriculturists suggests the possibility of domestication and early evolution here. However, that the Valley of Sibundoy is *not* the centre of origin of any tree *Datura* is attested by the absence of all *Datura* spp., and any solanaceous plants resembling them, in the non-cultivated flora. Were the Valley the site of domestication, we would expect to find some plants capable of self-reproduction, either sexually or asexually, and not wholly dependent upon man for survival. Evidently one or more clones of *D. candida* were brought into the

Valley at some remote time. Today, *D. candida* is found neither in the eastern lowlands, nor in the western highlands around Pasto, but several plants of *D. candida* 'Buyés' (*Bristol 1185*) were seen in the upper Río Juanambú drainage to the north. It may be postulated that *D. candida* was introduced to the Valley of Sibundoy via the trail from the Juanambú, and that following one or more such introductions the Valley became a centre of diversity.

### *Propagation*

All of the *Datura* cultivars in the Valley of Sibundoy are propagated exclusively by man through large cuttings. During the annual clearing of the gardens in preparation for the planting of maize and beans, some of the many trees and shrubs in the gardens are pruned, pollarded or even cut back to the ground. The removal of branches from a *Datura* plant to permit more planting space is the usual occasion for propagation. A branch measuring half a meter or more is simply thrust into the loose sandy soil and given no further attention. Occasionally, a more methodical planting is undertaken when the branches are cut into fairly uniform pieces and planted out in a row as a kind of hedge along the edge of a garden. These plants will be weeded during the general garden weedings four times a year.

Tree *Datura* branches at different stages of maturity differ in their capacity to root easily from cuttings. All of the leaves are borne on herbaceous stems which are only tardily lignified. Occasionally, usually after heavy pruning or pollarding, one or more stems grow up with unusual vigor and often reach a diameter twice that of a normal stem. The lignified part of normal stems is the least capable of forming roots under casual treatment; but the occasional, thick and uncommonly vigorous stems

develop roots quickly and abundantly when cuttings are taken from the region which has begun to lignify. One clone, 'Munchira', is difficult to propagate, since its stems are typically undersized, and the few stunted plants in existence are only rarely cut back. When this is done, however, the expected growth of thick, vigorous shoots appears, and cuttings made from these root easily.

*Abundance of Datura cultivars*

In the Valley of Sibundoy, tree *Daturas* are more conspicuous and more abundant than at many other localities in southern Colombia. At least 60 per cent of the trees are *D. candida* 'Buyés', while another 30 per cent are *D. candida* 'Dientes' and 'Amarón'. All of the economically more important cultivars comprise the remaining 10 per cent. Table V indicates the estimated number of individuals of each cultivar in 1963, and emphasizes the rarity of many.

TABLE V. Estimated number of individuals of *Datura* cultivars in the Valley of Sibundoy in 1963.

ca. 1000	'Buyés'
ca. 300	'Dientes'
ca. 200	'Amarón'
less than 40	'Culebra' 'Quinde' 'Guamuco' 'Biangán'
less than 20	'Munchira' 'Sangre'
less than 10	'Andrés' 'Ocre' 'Salamán'

It is difficult to judge whether the relative scarcity of nine of the cultivars reflects their more recent appearance in cultivation, or the degree of jealousy with which they

are guarded from other potential owners. A medicine-man once stated that he could not afford to be seen near an unusual *Datura* in another man's garden (6). If such a prohibition is general among the Sibundoy, the tree *Daturas*, however useful, may be increasing at an extremely slow rate. The two cultivars thought by the Sibundoy to be the most toxic, *D. candida* 'Munchira' and 'Salamán', are among the least abundant.

#### *Common names*

The three linguistic groups of people in the Valley of Sibundoy agree in grouping all the *Datura* cultivars in the Spanish term *borrachera* ('inebriant').<sup>5</sup> However, the Sibundoy believe this to be a Kamsá morpheme, not a loan word. Ten of the twelve cultivars are discriminated verbally, but because of the rarity of several, very few Sibundoy can name all ten. To name all ten, one must draw words from three languages, but because of generalized borrowing among these three, a speaker may not be aware of this. Kamsá lacks names for three cultivars, Inga for two. Table VI gives the common names recorded in 1962-63. A full account of the vernacular names is given with the taxonomic treatment of the cultivars. My capabilities did not permit the most precise form of phonetic records. Accurate pronunciation will be approximated most frequently within the Spanish, not the English, phonetic framework. An exception is *bui-ish* which I have written here *buyés*, conforming with the notation of Juajibioy (19).

#### *Economic importance*

Both my own investigations and the reports of others indicate that the *Daturas* are used about equally for

<sup>5</sup> Several non-solanaceous, non-psychotropic plants are also called *borrachera*, e.g., *Iresine celosia* L., *I. herbstii* Hook.f., and other unidentified plants.

TABLE VI. Common names employed in the Valley of Sibundoy for *Datura* cultivars.

Common name	Language	Scientific name
1. <i>Amarón</i> *	Spanish	<i>D. candida</i> 'Amarón'
2. <i>Andaqui</i>	Inga	<i>Datura</i> 'Andrés'
3. <i>Biangán</i> *	Inga	<i>D. candida</i> 'Biangán'
4. <i>Borrachera</i> ‡	Kamsá	<i>D. candida</i> ;
	(Spanish)	<i>D. candida</i> 'Buyès', 'Dientes'
5. <i>Borrachera de agua</i>	Spanish	<i>D. candida</i> 'Buyés', 'Dientes'
6. <i>Buyés</i> *	Kamsá	<i>D. candida</i> 'Buyés', 'Dientes'
7. <i>Cari</i>	Inga	<i>D. candida</i> 'Quinde'
8. <i>Cucu</i>	Inga	<i>D. candida</i> 'Amarón'
9. <i>Culebra</i> *	Spanish	<i>D. candida</i> 'Culebra'
10. <i>Chontaruco</i>	Inga	<i>D. candida</i> 'Biangán'
11. <i>Danta</i>	Inga	<i>D. candida</i> 'Biangán'
12. <i>Floripondio</i>	Spanish	<i>D. candida</i> 'Buyés', 'Dientes'
13. <i>Guamuco</i> *	?	<i>D. sanguinea</i> 'Guamuco', 'Sangre'
14. <i>Guamuco blanco</i>	Spanish	<i>D. candida</i> 'Buyés', 'Dientes'
15. <i>Guamuco floripundo</i>	?	<i>D. sanguinea</i> 'Guamuco', 'Sangre'
16. <i>Ngunsiana</i>	Kamsá	<i>D. candida</i> 'Quinde'
17. <i>Lengua de tigre</i>	Spanish	<i>D. candida</i> 'Culebra'
18. <i>Mutscuai</i>	Kamsá	<i>D. candida</i> 'Culebra'
19. <i>Munchira</i> *	Inga	<i>D. candida</i> 'Munchira'
20. <i>Quinde</i> *	Inga	<i>D. candida</i> 'Quinde'
21. <i>Salamán</i> *	?	<i>D. candida</i> 'Salamán'
22. <i>Salamanga</i>	?	<i>D. candida</i> 'Salamán'
23. <i>Salvanje</i>	Kamsá	<i>D. candida</i> 'Salamán'

\* Most frequently employed while speaking Spanish.

‡ *Borrachera* is usually 'tree *Datura*'. When the context is not clear it follows the cultivar name, e.g., *culebra borrachera* 'snake tree *Datura*'.

medicinal and for psychotropic preparations by the Sibundoy. This information is summarized in Table VII. Several of the cultivars are relatively unimportant, but to four attaches an aura of great respect for their power to alter consciousness drastically — even to cause death.

Most of the Sibundoy indicate a genuine interest in the *borracheras*, but individuals vary greatly in the ex-

Table 7. Uses of Datura cultivars. (x indicates one report\*.)

Cultivar	Use							
	Internal				External			
	Psychotropic	Poison	Medicine					Common Cold
			Vermifuge	Other	Antirheumatic	Suppurant	Erisipelas	
1. Guamuco } 2. Sangre }					x x	x x		
3. Buyés } 4. Dientes }					x			
5. Ocre								
6. Biangán	x x x 1 x 2			x 1				
7. Amarón					x	x		
8. Salamán	x				x			
9. Quinde	x x x x x x		x		x	x		
10. Munchira	x x x x x x 3 x 4		x 3	x x	x		x	
11. Culebra	x 5,6 x 7 x 8 x 9 x 10 x 11	x 5  x 8			x x x  x 8		x  x 8	x x 6 x 8 x 9
12. Andrés	x							

\* "Report" here means one of the following: (a) one Sibundoy's personal report to me, (b) one herbarium specimen notation by another botanist, (c) one primary literature statement not duplicating a herbarium notation. b and c are footnoted.

- |   |                                 |
|---|---------------------------------|
| 1. <i>Idrobo 2231</i> (COL)             | 7. <i>Schultes 20079</i> (GH)   |
| 2. (38)                                 | 8. (35)                         |
| 3. <i>Idrobo 2223</i> (COL)             | 9. <i>Idrobo 2221</i> (COL)     |
| 4. (20)                                 | 10. <i>Fernández 2641</i> (COL) |
| 5. <i>Schultes 3256</i> (COL, ECON, GH) | 11. <i>Mora 1023</i> (COL)      |
| 6. (29)                                 |                                 |

tent of their knowledge. For example, very few, perhaps only the medicine-men, are able to name all the cultivars accorded recognition by the culture; but even some of these may be unaware of cv. Salamán. Many informants can provide names and some kind of information on four or five different *borracheras*. The “average” landowner may own several ‘Buyés’ trees but probably has no economically important cultivar. Both his knowledge and his curiosity extend beyond the *borracheras* in his own garden. Following is a summary of economic uses.

1. ‘Guamuco’—A poultice of the flowers, together with ‘Culebra’ leaves and the stems and leaves of *Phenax integrifolius* Wedd. is used to treat rheumatism. The leaves are sometimes heated and tied over swollen infections, or an infusion of the leaves may be used to bathe infections.
2. ‘Sangre’—Same as ‘Guamuco’.
3. ‘Buyés’—Leaves of this cultivar are sometimes powdered and applied topically with other drugs to relieve rheumatic pain.

One informant said he always uses the fruit of this at maize planting time. He plants a few fruits along with the maize in order to prevent grubs or other soil pests from eating the germinating seed. This interesting gesture to protect the crop can scarcely be a general practice, however, because fruiting is rare. This is the only use ever encountered for any *Datura* fruit or seed in the Valley of Sibundoy.

4. ‘Dientes’—Same as ‘Buyés’.
5. ‘Ocre’—No use encountered.
6. ‘Biangán’—The leaves and flowers can be ground

finely and mixed into a dog's food prior to a hunting expedition, supposedly to make the animal locate more game. The behavior of a dog so intoxicated would be most interesting to observe, but hunting is rarely practiced in the Valley today.

An herbarium specimen from Sibundoy (*Idrobo 2231*; COL) records this note on *biangán borrachero*: "Taken as a stimulant when feeling fatigue and also as an hallucinogen." I did not learn of these uses by the Sibundoy. However, one Sibundoy related how his three year old daughter ate part of some flowers of this near the house and became dizzy and incoherent, falling to the ground and shouting periodically for many hours thereafter.

Yepes (38) included this in his account of intoxicating plants used by a medicine-man from Santiago (not of the Sibundoy tribe).

7. 'Amarón'—The leaves of this cultivar are sometimes used as a suppurant and as an anti-rheumatic.
8. 'Salamán'—This cultivar is the rarest, being known only in one garden, and its owner considers it the most toxic of all the *Daturas*. He uses the leaves, along with those of 'Quinde' and 'Culebra' in an infusion for bathing rheumatic limbs and joints. He has also used both the leaves and flowers for their psychotropic effect, as described below.
9. 'Quinde'—This is the most widely known of the economically important cultivars. An infusion of the leaves is employed both as an anti-rheumatic and as a vermifuge, and the leaves are applied topically as a suppurant. The leaves and occasionally the flowers are used psychotropically, probably more often than any other Sibundoy *Datura* (cf. below).



10. 'Munchira'—The minute and highly toxic leaves are employed medicinally as an anti-rheumatic, emetic, carminative, vermifuge and to treat erysipelas. Their psychotropic use is described below.
11. 'Culebra'—This cultivar has received more attention from botanists because of its especially curious morphology, and because of its description by Schultes in 1955, as a distinct genus, *Methysticodendron*. Despite the numerous reports on its medicinal, and especially psychotropic, importance, my investigation showed it to be less important to the present day Sibundoy than either 'Quinde' or 'Munchira'. I found it used against *resfrio* ('colds,') and against erysipelas, and more often than other cultivars, against rheumatism.

Schultes reported the use of *culebra borrachera* in treating swollen joints, combating chills and fevers, and in divination, prophecy, therapy, and learning "witchcraft" (29).

Theilkuhl, who visited the Sibundoy in 1956, was also able to learn of the importance of this plant as a psychotropic drug, as well as medicinally in the form of poultices, "to combat rheumatism, swollen infections, muscle cramps, erysipelas, and in the form of baths, colds" (35).

12. 'Andrés'—One informant said he had used the flowers psychotropically.

### *Psychotropic use*

Literature dealing with the *Daturas* of the Valley of Sibundoy has emphasized their importance as psychotropic, or mind affecting, drugs (27, 29, 30, 31, 32, 33, 36, 38). Writings based directly upon experience among the Sibundoy are those of Schultes (1955) and Theilkuhl

(unpublished thesis, 1957) dealing only with 'Culebra', and of Pedro Juajibioy (1960, MS.). Yepes interviewed Inga-speaking medicine-men travelling through Popayan to the north (38).

Because of the possibility that the Sibundoy learned the use of some of the *Datura* cultivars from the nearby Inga-speaking peoples of Santiago, Colón and San Andrés, it is well to include here the following information collected from some of their medicine-men (38):

*Borracheras*. (Daturas). They are characterized as 'calientes (1) equal to fire.' They distinguish more toxic and less toxic species, and give preference to the latter for divinatory purposes. When they take them, they have an assistant accompany them because they produce furious intoxication beyond certain dosages.

*Borrachera*. 'Lengua de Tigre or Tinje' (2). In small quantity, it gives strength. Beginning by cooking three pairs of leaves or one flower, one progresses to larger dosages with time, and in this form it serves to make divination, diagnosis and witchcraft [*maleficio*].

*Biangán borrachera*. During the wane of the moon, 2 pairs of leaves are given to the dogs so that they will go out as hunters (3).

*Danta borrachera*. It is given to hunting dogs so that they may follow easily the trail of any animal (3).

---

(1) *Calientes* ('hot' plur.), medicines which "cure the diseases . . . produced by cold." (38).

(2) Identity unknown, but apparently referable to *D. candida* Saff.

(3) Apparently *D. candida* 'Biangán'.

The Sibundoy [Inga-speaking native of the Valley of Sibundoy, not a Sibundoy] knows intoxication with *borrachero* by the dryness of the throat and the dilatation of the pupil (38).

Schultes, who investigated the plants among the Sibundoy in 1942, 1946 and 1953, summarized his findings on the psychotropic aspects of *culebra borrachera* in these words (29):

This intoxication, resorted to by the witch-doctors only for very important or difficult cases of divination, prophecy or therapy, usually lasts for two full days and sometimes may persist for four— with a long period of complete lack of consciousness. Missionaries

who have been at work in the Valley of Sibundoy for more than a quarter of a century suspect that the death of one aged witch-doctor may have been due to an overdraft of this narcotic.

Smaller doses of the drug are administered to boys who are studying witchcraft. Certain of the medicine-men's secrets apparently are imparted only when the novitiate is "under the protection" of this narcotic.

Both Schultes' and Theilkuhl's descriptions of the method of preparation of the drug are nearly the same as that described below for the other cultivars.

Theilkuhl, after visiting the Sibundoy in 1956, wrote of this clever use of *culebra borrachera* (35):

. . . it is suspected that occasionally unscrupulous Indians use it as a 'burundanga', that is, to deprive outsiders of their senses and rob them.

It seems that the 'médicos' or 'curacas' take an aqueous maceration of the leaves to produce hallucinations, during which they say they see the solution of difficult cases of divination, prophecy or diagnosis. One of the 'médicos' questioned affirms that the 'culebra borrachera' is employed in a manner similar to that of 'yagé' [*Banisteriopsis* spp.; (6)], the focal point of Amazonian medical practice.

Yepes, Schultes and Theilkuhl use the words divination, prophecy, diagnosis and witchcraft in describing the psychotropic use of *Datura*, yet no Sibundoy I encountered stated such reasons for using any *Datura* drug. Nor has Haydée Seijas found these usages during more than one year of investigating Sibundoy ethnomedicine (pers. comm.). Most of those with whom I talked appeared to consider the drugs hallucinogens, but I failed to record precisely their statements. Had this been done by myself and the other observers, we might assess the psychological, as well as social, significance more accurately.

The Sibundoy observer, Pedro Juajibioy, has recorded five instances of intoxication with *Datura* among his acquaintances (20). In three cases, it is stated that the leaves were taken to cure disease: *agua blanca* ('white

water') and stomach ache. *Agua blanca* refers probably to gonorrhoea (Seijas, pers. comm.). Only in one case does he mention the identity of the cultivar—'Munchira'. The following experience may be due to use of *D. candida* 'Culebra':

The first time I drank six leaves at night. I got drunk. I saw woods full of trees, people from somewhere else, animals, stumps, pastures full of all kinds of snakes that came up the slopes of the pasture all in green. They coiled to bite me. As the intoxication took greater hold of me, the house started to revolve against the world, and the same with the things in the house, etc. But the snakes stretched for the kill!

Such horrible hallucinations may be commonplace. The Sibundoy appear to have an instinctive fear of snakes, despite the supposed absence of poisonous ones in the Valley. One medicine-man who had never taken 'Culebra' thought that if he did he would see "ugly things, snakes".

Juajibioy (ibid.) gives another example which was surely entertaining for observers:

I took . . . only six leaves. I got drunk after an hour [and?] my vision went dim. During the day I saw unknown people duplicated—that is, one person in two men. I felt crazy. I started running, then took off my clothes, and ran around naked in the garden, and showered myself with the piles of dirty weeds left by the hired men who were working at that moment. I also insulted them freely. And I went about kissing several tree trunks thinking they were my fiancée. Later I took to writing letters. I went out to the pasture with a rope to catch a horse to ride, but it turned out to be a dog.

Despite these reports, I did not succeed in locating any native of the Valley who had employed *D. candida* 'Culebra' for its psychotropic action. One prominent medicine-man has in his garden eight plants of this clone, perhaps one quarter of all the plants extant in the Valley. While he regularly takes the psychotropic *Banisteriopsis* (6) and has tried several of the *Daturas*, he has not taken 'Culebra' and knows of no one who has done

so. Frequently natives do not specify which *borrachera* they refer to unless questioned, and outsiders may easily assume *culebra* is intended.

Seijas reports that *borrachera* is sometimes added to chicha, the nutritious daily beverage of low alcohol content (pers. comm.). However, she adds that many consider this an antisocial practice, since it often results in disorderly behavior and fighting.

A dozen cases of intentional intoxication with the other three important *Datura* cultivars have come to my attention.

As psychotropic drugs, it is 'Quinde', 'Munchira' and (reportedly) 'Culebra' which are employed principally. The juice of the leaves, or occasionally of the flowers, is taken, usually alone and unheated. Depending on the size of the leaves, between one leaf and twenty-four leaves ("twelve pairs") are taken. Normally the leaves are taken in pairs, and sometimes (Seijas, pers. comm.) only as even numbers of pairs. While one leaf is sufficient in the case of the large-leaved 'Salamán', two or four of the smaller 'Quinde' leaves are used. Between eight and twenty-four of the minute 'Munchira' leaves are required. The leaves are usually macerated and crushed and the expressed juices taken alone or sometimes mixed with a jigger of water or *trago* (alcoholic distillate), partly for convenience. Sugar is sometimes added to the juice to make it more palatable. One informant heated 'Munchira' leaves in a very small amount of water to extract the juices.

One medicine-man made the drug by expressing the juice from one flower each of 'Salamán', 'Quinde' and 'Munchira', thus obtaining about 15 cc. to which he added sugar. Another individual used only two flowers, both of 'Quinde'.

The psychotropic use of these *Daturas* is not restricted

PLATE LIII



Salvador Chindoy and his wife posing beside his aged 'Munchira' tree. (A prop prevents the crown from leaning on the roof of the house.)

to medicine-men; they are in exclusive possession of neither the trees nor of the knowledge of how to prepare the drug. However, it is likely that in many cases a medicine-man prepares or directs the preparation of the drug, especially with regard to dosage.

The descriptions of the psychotropic effects, related to me by those who have experienced them, are in remarkable agreement. It stuns them, makes them lose their senses, and leaves their mouths and throats so unpleasantly dry that they can neither swallow nor talk for many hours. Their vision is disturbed, bringing objects nearer and farther away, and some experience visual hallucinations, especially of animals that they fear. One woman said that taking 'Munchira' made her feel stronger and younger. Unfortunately, the dominant memory is of the long hours with a dry, constricted throat which prevented eating, drinking and speaking. Informants discussing *Datura* narcosis often continue on with their experiences with *biawú* (*Banisteriopsis* spp.), experiences that they usually recall as more pleasant and more valuable (6).

### *Chemistry*

Chemical analyses of *Datura candida* 'Culebra' (*Methysticodendron Amesianum*) were done within five years after its description in 1955 by Schultes.

Theilkuhl found hyoscyamine and atropine in the leaves, though he believed the last-named was produced probably during the isolation process (35). Pachter and Hopkinson, who worked with thirteen kilograms of dried leaves and stems, found four alkaloids present, of which 1-scopolamine accounted for 80 per cent (25). Atropine was also present, but two others in smaller amount were not identified. The plant materials for both studies were obtained in the Valley of Sibundoy or originated from

such material. To my knowledge, no other *Datura* material deriving from populations in the Valley has been analyzed chemically or pharmacologically.

The alkaloids of the genus *Datura* have been subjected to intensive study. For a concise review by Edward Leete see Avery *et al.* (1). The principal alkaloids of the tree *Daturas* are the tropanes hyoscine (scopolamine), hyoscyamine and atropine. W. C. Evans and his co-workers are actively investigating these and closely related alkaloids in *Datura cornigera* (white flowered) and *D. sanguinea* (11, 12, 13, 14). Their efforts promise to demonstrate alkaloidal composition and biogenesis in all the tree *Daturas*. They are currently analyzing several of the cultivars described herein. The roots of tree *Daturas*, like those of the herbaceous forms, contain in addition to the above named alkaloids, esters of tiglic acid with 3 $\alpha$ -hydroxy-, 3 $\alpha$ , 6  $\beta$ -dihydroxy- and 3 $\alpha$ , 6  $\beta$ , 7  $\beta$ -trihydroxytropine. Ditigloyl esters appear to be present in all the *Datura* species examined. *D. sanguinea* contains acetoxy derivatives, one occurring as the mixed ester 3 $\alpha$ -tigloyl-6  $\beta$ -acetoxytropine.

### *Pharmacology*

The psychotropic effects of the crude drugs upon the Sibundoy have been noted above.

Atropine, hyoscyamine and scopolamine are of considerable importance in modern medical practice, but the commercial sources of the drugs at present are other solanaceous genera, *Duboisia* and *Hyoscyamus*.

Henry summarizes the pharmacologic effects of these as follows (17):

When administered internally in toxic doses, atropine at first stimulates but eventually depresses the central nervous system, giving rise to hallucinations, incoherent speech, delirium and convulsions, followed by stupor and coma. It paralyzes muscles and secretory glands to the effects of stimulation by post ganglionic, cholinergic,



nerve fibres. It is to this action that the dryness of throat and mouth characteristic of belladonna poisoning is due.

The natural alkaloid, *l*-hyoscyamine and its *d*-isomeride resemble atropine (*dl*-hyoscyamine) qualitatively in action. . . .

[Hyoscine (scopolamine)] has an action similar to, but more transitory than, that of atropine on the peripheral, cholergic, autonomic nervous system. Its action on the central nervous system is different. Generally it induces a feeling of fatigue and drowsiness passing into sleep. In some cases there may be a preliminary stage of excitement, and with large doses excitement indistinguishable from that of atropine intoxication may occur. The respiratory centre is depressed from the start. The *l*-isomeride has the more powerful peripheral action, although the central action of both isomerides is the same (p. 106-7).

Claus and Tyler (10) add that atropine applied locally causes a "dullness or slight paralysis of the sensory nerves", thus easing pain. This action probably relates to the frequent use of leaves in treating rheumatism.

General statements such as these give a good indication of the types of pharmacologic activity which probably will be demonstrated in the tree *Daturas*, and suggest the basis for both their medicinal and psychotropic use by the Sibundoy. However, because the Sibundoy *Daturas* are constant hosts to several viruses which may affect the cultivars differently, and because the Sibundoy have encountered greatly differing levels of toxicity, it seems very probable that an eventual understanding both of the biogenesis and of the pharmacologic activity of the Sibundoy *Datura* alkaloids will constitute a unique chapter in our increasing knowledge of the solanaceous tropane alkaloids.

*Key to Datura in the Valley of Sibundoy*

- A. Exposed corolla mostly red, leaves soft-pubescent *D. sanguinea*
  - a. Corolla tube yellow at the middle . . . . . cv. Guamuco
  - aa. Corolla tube green or red at the middle, lacking yellow entirely . . . . . cv. Sangre
- AA. Corolla lacking red, leaves not soft-pubescent . . . *D. candida*

*Key to Datura* (cont.)

- a. Corolla yellow-orange . . . . . cv. Ocre
- aa. Corolla white
  - b. Corolla very deeply lobed, filaments apically contorted, leaves long-linear . . . . . cv. Culebra
  - bb. Corolla slightly lobed, filaments straight, leaves not long-linear
    - c. Leaves with regular venation and uniform margins
    - d. Leaves dentate . . . . . cv. Dientes
    - dd. Leaves entire
      - Pistil exceeding 30 cm., corolla 31-43 cm. . . . . cv. Andrés
      - Pistil less than 25 cm., corolla 20-30 cm.
        - Leaves yellowish, pistil 22-24 cm. . . . . cv. Biangán
        - Leaves not yellowish, pistil 14-21 cm. . . . . cv. Buyés
  - cc. Leaves with irregular venation and variously erose margins (cf. Plate LII) . . . . . cvs. Amarón  
Salamán  
Quinde  
Munchira

Taxonomy of the genus *Datura*  
in the Valley of Sibundoy

1. *Datura sanguinea* Ruiz & Pavón Fl. Peruv. 2: 15. 1799.

*Brugmansia bicolor* Persoon Syn. Pl. I: 216. 1805; Lindley Bot. Reg. 20: pl. 1739. 1834.

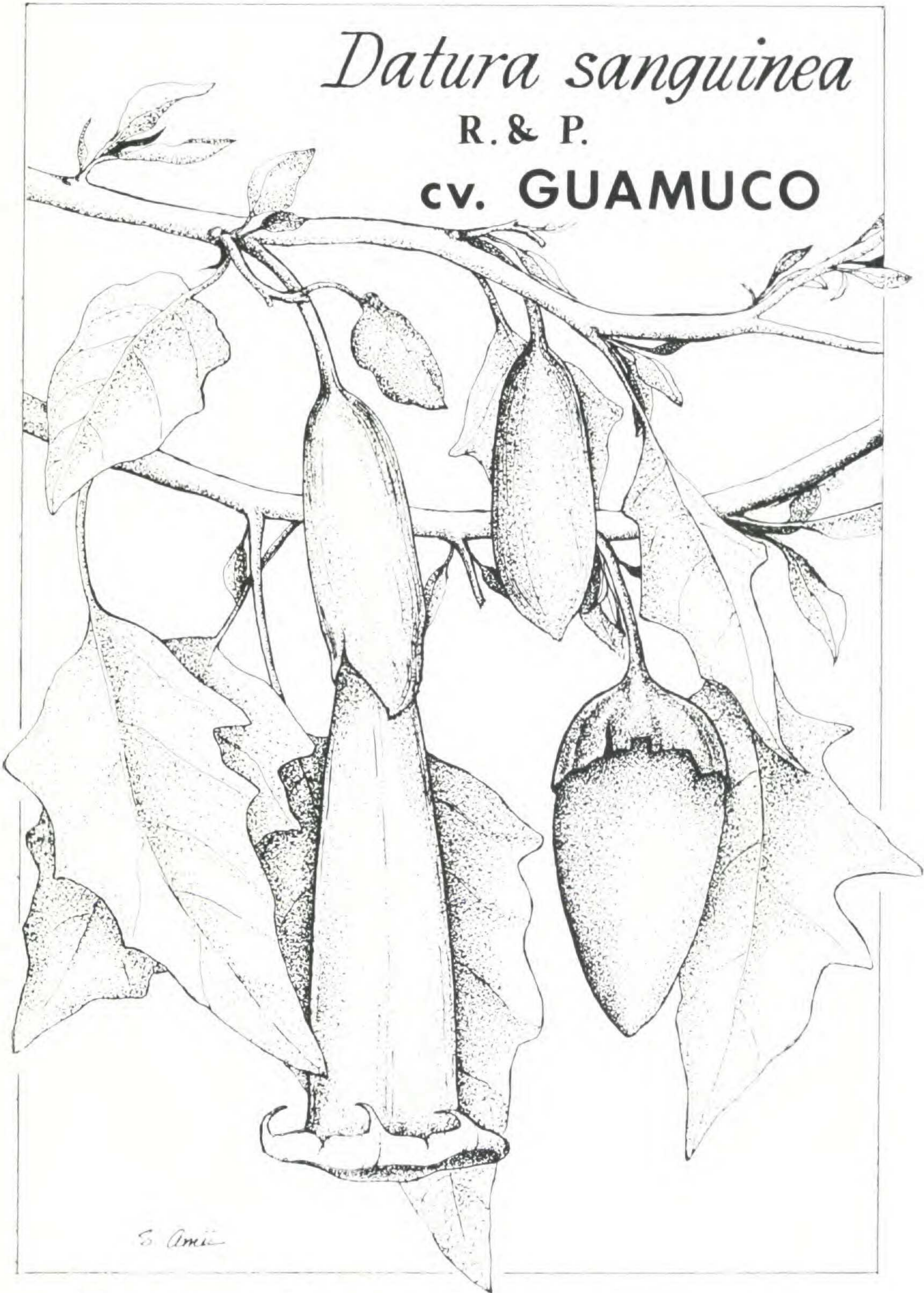
*B. sanguinea* D. Don in Sweet Brit. Fl. Gard. II. 3: pl. 272. 1835; Lagerheim Bot. Jahrb. Engl. 20: 662. 1895.

Small trees, 2-5 meters in height; leaves soft-pubescent, the lower repand to angular, the upper usually entire; flowers 17-25 cm. long, the corolla with a short-toothed, recurved to strongly reflexed (rarely erect) limb, the tube typically green within the calyx, yellow at the middle and red or orange-red (rarely yellow-orange to bronze) toward the limb, the ribs yellow; anthers 12-18 mm.; stigma obtuse; fruit ovoid (rarely oblong-elliptic), the base rounded to acute (rarely acuminate) and mucronate, in cross section usually bi-

*Datura sanguinea*

R. & P.

cv. **GUAMUCO**



*Datura sanguinea* R. & P. cv. Guamuco. Flowering and fruiting branches,  $\times \frac{1}{2}$ .

laterally flattened, or 4–5-sided to nearly round with 2 or 4 longitudinal sulci; seeds verruculose and lacking a greatly thickened testa.

1a. **'Guamuco'** n. cv. Plate LIV.

Calyx broad, 1–3-lobed, 6.7–12.2 cm. long; corolla 17.6–21.2 cm., yellow at the middle, red toward the limb; stamens 15.7–19.2 cm. (including their adnation to corolla), anthers 15–18 mm.; pistil 15.5–19 cm.; fruit ovoid to conical, bisulcate, with half-persistent calyx, rare. N=12 (*Bristol 1114*).

The pollen very closely resembles that of *D. candida*. Examination of 500 microspores of one plant showed 58.8 per cent to be abnormal.

Common names: *Guamuco*, *Guamucu borrachera*.

*Guamuco* is a non-Kamsá term, also used occasionally for *Spigelia pedunculata* HBK. It may relate to *guambia* 'poison', for the Sibundoy know both plants to be highly poisonous.

COLOMBIA: Comisaria del Putumayo: Valle de Sibundoy, alt. ca. 2200 m. —1.5 km. S Sibundoy. "Tree 3 m.; corolla yellow below, reddish orange above, veins yellow above; anthers white. In cultivation; very rare." 20-XII-1962, 419\* (ECON). — San Andrés. "'Guamuco'. Shrub 2.5 m.; corolla orange-red, limb recurved. Cultivated, infreq." 18-III-1963, 653. (COL, ECON, PASTO, US). — 3–5 kms. S Sibundoy. "'Guamuca borrachera'. Tree 3.5 m.; a few lvs. entire; corolla tube green, becoming yellow; throat and limb red, becoming orange during anthesis; anthers white, pollen abundant; no fruit. Indian garden, very infreq." 12-VI-1963, 1114 (COL, ECON, BISH, PASTO, S, US). — 2 kms. SE Sibundoy. "'Guamuco'. Shrub 2 m.; corolla tube green, becoming light orange, limb and throat deep red, becoming lighter. Indian houseyard, very infreq." 27-VIII-1963, 1345 (COL). — Colón. "'Guamuca borrachera'. Tree 4 m., trunk diam. 23 cm., young bark brown; calyx slightly purplish; corolla red-orange except greenish yellow where emerging from calyx, and the ribs yellow, limb recurved; fr. ovoid or triangular, acuminate with 2 furrows, the calyx half-persistent; seeds dark brown." 23-IX-1963, 1420 (COL, ECON, BISH, K, PASTO, US). — Sibundoy. 29-V-1946, *Schultes & Villarreal 7689* (COL, ECON, US).

\* Collection numbers are those of the author, unless otherwise specified.

1b. cv. **Sangre.**

This cultivar, described in Bot. Mus. Leaflet Harvard Univ. 21: 236 (1966), is distinguished by the corolla color, which is deep red (basally green), entirely lacking in yellow. The flower size and shape is variable; in the Valley of Sibundoy, the calyx is narrow, terminating in a single apicule, 8.8–9.5 cm. long, the corolla 17.6–21 cm. long. Stamens (incl. their adnation to corolla) 15.4–18.9 cm., anthers 13–14 mm. and pistil 16.9–19 cm. The oblong, bisulcate fruit has a persistent calyx.

Common names: *Guamuco*, *Guamuco borrachera*, as for the first cultivar.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—San Andrés. “‘Guamuco’. Shrub 2.5 m.; corolla red, limb spread somewhat, but not rolled upward as in 653. Cultivated.” 18-III-1963, 652 (COL, ECON, PASTO, US).—San Andrés. “Arborescent 2.5 m.; exposed corolla red (no yellow present); fr. 90 × 55 mm., ovoid, 5-ridged, not flattened. Roadside, common.” 20-VIII-1963, 1309 (COL, ECON, US).

**2. *Datura candida* (Pers.) Safford** in Journ. Wash. Acad. Sci. 11: 182. 1921.

*D. arborea* Ruiz & Pavón Fl. Peruv. 2: 15. pl. 128. 1799; non *D. arborea* L.

*Brugmansia candida* Persoon Syn. Pl. 1: 216. 1805.

*D. aurea* Lagerheim Gartenfl. 42: 33. 1893; Safford *ibid.* 186. 1921.

*B. aurea* Lagerheim in Bot. Jahrb. Engl. 20: 664. 1895.

*B. arborea* Lagerheim *ibid.* 663.

*D. affinis* Safford *ibid.* 186.

*D. Pittieri* Safford *ibid.* 187.

Small trees, 3–5 meters in height; leaves glabrous or slightly pubescent, ovate or oblong-elliptic, entire or coarsely dentate; calyx 1.5–3 cm. broad, 1–4-toothed; the slender basal part of the white corolla wholly enclosed by the calyx, the limb flaring broadly with long

(4–9 cm.) recurved teeth; anthers distinct; fruit oblong-cylindric to fusiform and lacking a persistent calyx; seeds angular, with a greatly thickened, suberose testa.

2a. **'Buyés'** n. cv. Plates XLIX and LV.

Ratio of leaf width to length .346–.577, calyx 8.5–16.1 cm., corolla 19.6–29.3 cm., stamens (incl. adnation of filaments to corolla) 13.2–19.9 cm., anthers 30–41 mm., pistil 14.3–21.2 cm. N=12 (*Bristol 1117, 1266*).

This is the common *borrachera* found throughout the Valley in inhabited locations and where there is evidence of sites of former habitation. Cv. Buyés is the most variable of all the *D. candida* cultivars. Several to many clones are included here, but they are only obscurely differentiated, and neither the natives nor the people of Spanish descent distinguish among them. Differences in the splitting of the calyx, diameter of corolla tube, length of corolla and length of corolla teeth, as well as others, can be seen.

Common names: *Borrachera*, *borracherushe*, *buyés borrachera*, *buyés borracherushe*, *borrachera de agua*, *floripundo*, *floripondio blanco*, *guamuco blanco*, *guamuco floripundo*.

*Borrachera* 'inebriant' is from the Spanish *borracha* 'wine skin', whence *borracho* 'drunkard'. The Sibundoy believe it to be a word of their own language, Kamsá, an indication of its long usage among them. Elsewhere in Colombia *D. candida* is known as *borrachero* 'inebriating tree'.

*Borracherushe* is a variant, and more typically Kamsá form, of the first.

*Buyés* 'water' is of unexplained application here, but perhaps it refers to the plant's preference for a wet site, and the common habit of planting it near ditches.



*Datura candida* (Pers.) Saff. cv. Buyés. Flowering and fruiting branches,  $\times \frac{1}{3}$ .

*Floripondio* (Spanish) 'floribunda' refers to "the size and abundance of its flowers" (38).

*Agua* (Spanish) 'water', equivalent to *buyés*.

*Blanco* (Spanish) 'white', for the flower color.

*Guamuco* (language?) is the name in the Valley and elsewhere for the red-flowered *D. sanguinea*.

*Buyés borrachera* and its variants are employed with about equal frequency by the Sibundoy, while the remaining names are used only by immigrants from Nariño and elsewhere in Colombia.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—Sibundoy, collados al norte del pueblo. "Nombre castellano: 'borrachera'. Large bush. Fl. white." 12-II-1942, *Schultes 3207* (GH, NY).—Sibundoy. "'Bui-ish borrachera'. Tree 4 m.; corolla white, fragrant, limb cordate between teeth. Calyx teeth 2-3. Borders, freq." 26-IV-1963, 887 (COL, ECON, BISH, K, PASTO, S, US).—Sibundoy. "'Bui-ish borrachera'. Arborescent 2.5 m.; corolla white. Borders, frequent." 26-IV-1963, 889 (ECON).—3 km. SW Sibundoy. "Tree 4 m.; corolla white. Infreq. in borders." 9-V-1963, 999 (COL, ECON, PASTO, US).—4 km. SW Sibundoy. "'Bui-ish borrachera'. Tree 4 m. Secondary woodland." 3-VI-1963, 1098 (COL, ECON, K, PASTO, US).—Sibundoy. "'Bui-ish borrachera'. Tree 3.5 m.; corolla white; frs. green, few. Hedge row, frequent." 10-VI-1963, 1109 (COL, ECON, US).—3-5 km. S Sibundoy. "'Bui-ish borrachera'. Tree 5 m.; corolla white; fr. green. Borders, common." 12-VI-1963, 1117 (COL, ECON, US).—Sibundoy. "'Bui-ish borrachera'. Tree 4 m.; frs. pendulous, corolla white; fr. green, indehiscent. Border, frequent." 10-VI-1963, 1193 (COL, ECON, BISH, K, PASTO, S, US).—Sibundoy. "'Bui-ish borrachera'. Tree 4 m.; corolla white, limb recurved. Borders, frequent." 22-VII-1963, 1255 (COL, ECON, BISH, K, PASTO, S, US).—Colón. "Tree 2.5 m.; corolla white. Border, Indian garden." 25-VII-1963, 1266 (COL, ECON, BISH, K, PASTO, S, US).—2 km. SW Sibundoy. "'Bui-ish borrachera'. Arborescent 2-5 m.; frs. pendulous, corolla emerging pale yellow, white when fully open; anthers white; stigma very pale yellow. Borders, common." 19-IX-1963, 1388 (ECON).

## 2b. 'Dientes' n. cv.

Leaves dentate, ratio of width to length .550, calyx



11.1–13.4 cm., corolla 22.5–25.7 cm., stamens (incl. adnation of filaments to corolla) 14.3–16.5 cm., anthers 32–38 mm., pistil 15.8–17.8 cm., fruiting occasionally.

The distinguishing feature of this cultivar is the dentate leaf margin which is usually restricted to the distal half of the leaf, but which may occur throughout the length. Almost all of the plants in the Valley of Sibundoy occur in a single locality two to three kilometers southeast of the town of Sibundoy. Along three main trails covering two kilometers here, the many landowners have planted nearly 250 of these trees.

Common names: *Buyés borrachera*, etc., the same as for *D. candida* 'Buyés'.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—2 km. SW Sibundoy. "Trailside, very infreq." 14-IV-1963, 774 (ECON).—3 km. S Sibundoy. "'Bui-ish borrachera'. Tree 4 m.; corolla white; fr. green, pericarp drying and decaying but indehiscent. Border, infreq." 15-VI-1963, 1122 (ECON).—2.5 km. S Sibundoy. "'Bui-ish borrachera'. Tree 4 m.; corolla white, pendulous; frs. broadly fusiform, indehiscent. Borders." 2-X-1963, 1435 (COL, ECON).—2.5 km. S Sibundoy. "Arborescent 3 m.; corolla white, pendulous. Indian gardens, borders; frequent." 2-X-1963, 1438 (ECON).—2 km. SE Sibundoy. "Arborescent 4 m.; corolla pendulous, white, limb and teeth recurved; fr. terete, fusiform (15.5 × 3.5 cm.), indehiscent. Borders, frequent." 8-X-1963, 1447 (COL, ECON, BISH, K, PASTO, S, US).

Another collection (1111) has both distally dentate and entire leaves from the same plant. In addition, the calyx is very narrow with the limb partly recurved, and the corolla tube is also narrow. Ten to 12 trees occur in a single hedge row in the town of Sibundoy. During May and early June, 1963, the only *Daturas* blooming in the Valley were this planting and 'Culebra'. The owner called this "bui-ish borracherushe" and said that the first cuttings had been brought here from further south in the Valley, where most of the Sibundoy reside.

COLOMBIA: Comisaria del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—Sibundoy. “‘Bui-ish borracherushe’. Tree 3.5 m.; lvs. entire or distally toothed; calyx slender, limb curling; corolla white. Hedge row, infreq.” 11-VI-1963, 1111 (COL, ECON, BISH, K, PASTO, S, US).

2c. ‘Ocre’ n. cv. Plate LVII.

Leaves entire, the base acute, ratio of width to length .402–.498, calyx relatively narrow, 12.8–15.9 cm., corolla long, 25.4–31 cm., ochre color, stamens (including their adnation to corolla) 16.4–22.6 cm., anthers very long, 40–44 mm., pistil 17.8–23.8 cm. Fruit not seen. N=12 (*Bristol 1267*).

This very rare cultivar is unique in the light orange or ochraceous color of its flowers. Two plantings are known, a single tree near Sibundoy, and a short hedge row in Colón. The present owners of these trees with strikingly different flowers showed little interest in them.

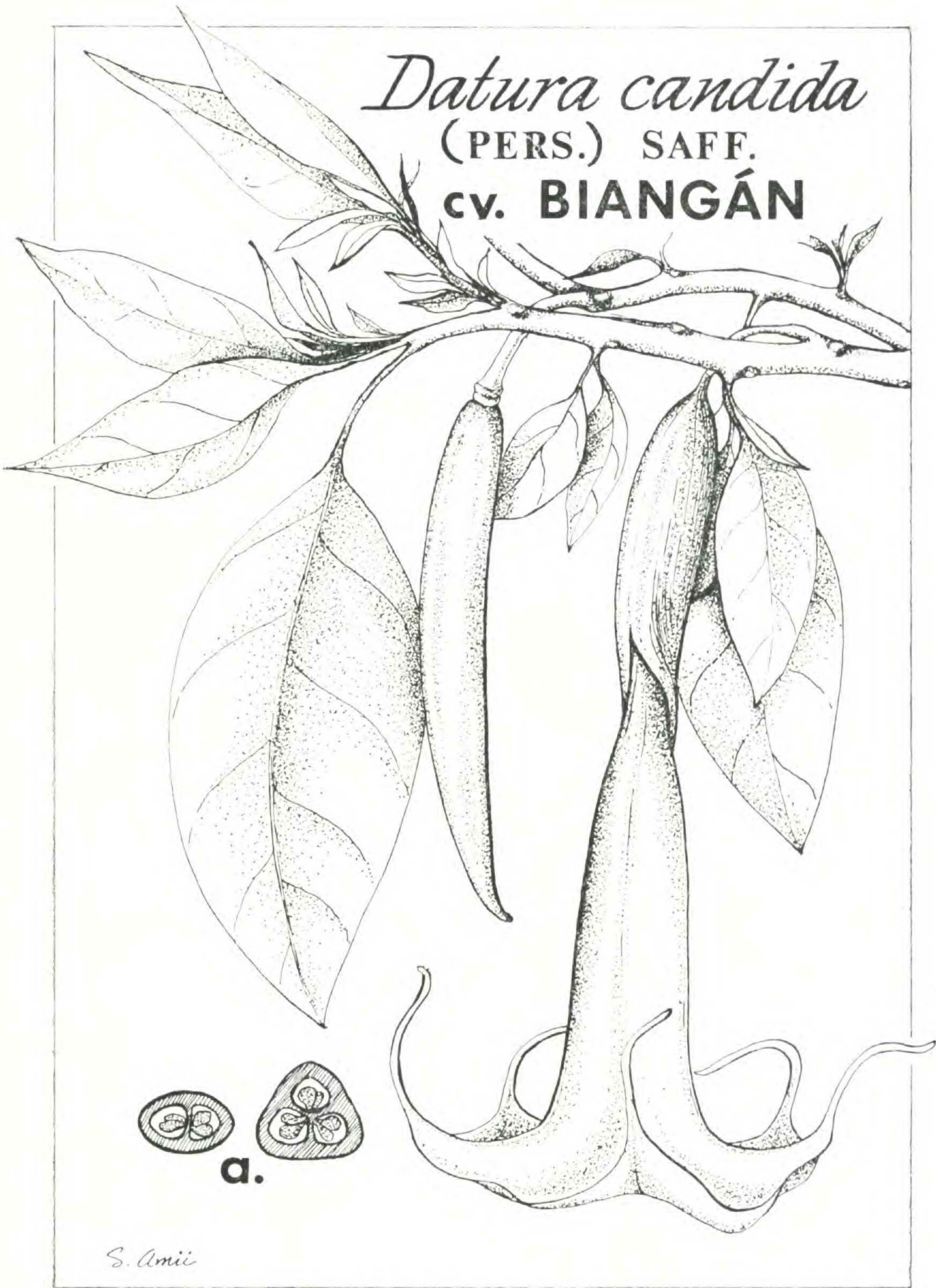
Common names: The only name given this cultivar by its owners is *borrachera* (‘inebriant’) in Sibundoy and *borrachero* (‘inebriant tree’) in Colón. In Sibundoy, the response *tsushie borrachera* (‘yellow inebriant’) was eventually evoked, but it was clear that *tsushie* was a purely descriptive word and not an established phytonym.

COLOMBIA: Comisaria del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—Colón. “‘Borrachero’. Tree 4.5 m.; corolla light orange; not fruiting. Indian garden, very infreq.” 25-VII-1963, 1267 (COL, ECON, BISH, K, PASTO, S, US).—1.5 km. SW Sibundoy. “‘Tsa-shie borrachera’. Tree 3 m.; corolla light orange. Indian garden, very infreq.” 12-VIII-1963, 1297 (COL, ECON, PASTO, US).

2d. ‘Biangán’ n. cv. Plate LVI.

Leaves yellowish, entire, ratio of width to length, .318–.488, calyx length 10.2–16.3 cm., corolla long, 28–32.9 cm., in some the slender basal part of the tube well exposed, stamens (including their adnation to corolla) 19.9–23.2 cm., anthers 37–43 mm., pistil 21.6–24.4

*Datura candida*  
(PERS.) SAFF.  
cv. BIANGÁN



*Datura candida* (Pers.) Saff. cv. Biangán. Flowering and fruiting branches,  $\times \frac{1}{3}$ . a, Cross sections of two fruits from the same tree,  $\times \frac{1}{2}$ .

cm., fruit occasional, narrowly fusiform, somewhat grooved and ridged, 2 or 3 locular, calyx persistent or caducous. N = 12 (*Bristol 1431*).

Cv. *Biangán* is easily recognized by the yellowish foliage and, if they are available, the unusual fruits, resembling those described by Safford (28) for *D. suaveolens*. A photograph of 'Biangán' flowers appears in Perry (27), page 335, centre figure.

Common names: *Biangán borrachera*, *chontaruco borrachera*, *danta borrachera*.

The Sibundoy know two deer, a small one (*biangán*), said to be only one half meter high, which lives near the marsh in the centre of the Valley, and a larger one (*mongojo*) of the high mountains and páramos. *Chontaruco* ('biangán') may be an Inga term, while *danta* ('tapir') is a widespread indigenous word adopted by Spanish. The Sibundoy think of *D. candida* 'Biangán' as a stimulant for dogs on hunting trips, but whether their names refer to inebriated dogs capturing game animals or to the possibility of game animals becoming inebriated themselves by browsing on the leaves, is unclear to me.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. ca. 2200 m.—Sibundoy. "'Danta borrachera'. Bush". 29-V-1946, *Schultes & Villarreal 7638*(US).—Sibundoy. "N. v. 'Danta borrachero,' 'Biangán borrachero' (Kamsa). Arbusto de 3 m. Hojas amarillentas. Flores vivas, no vistas. (Se toma como estimulante cuando se siente cansancio y también como alucinógeno)." 12-VI-1956, *Idrobo 2231* (COL).—3 km. SE Sibundoy. "'Bui-ish borrachera'. Arborescent 3 m.; upper lvs. small, yellowish; fls. (except calyx) white throughout. Edge of cornfield." 8-I-1963, 458 (COL, ECON, PASTO).—5 km. SW Sibundoy. "'Biangán borrachera'. Arborescent 2.5 m., lvs. yellowish green, calyx becoming yellow; corolla white (between lobes rounded or very slightly emarginate); no fr." 29-IV-1963, 890 (COL, ECON, BISH, K, PASTO, S, US).—5 km. S Sibundoy. "'Biangán borrachera'. Tree 3.5 m., lvs. yellowish; corolla white; fr. green (loose, persistent calyx removed), 2-3 carpellate. Border, very infrequent." 27-VI-1963, 1162 (COL, ECON, K, PASTO, US).—3 km. S Sibundoy. "'Biangán borrachera'. 2 m., lvs. yellow-green; corolla white; frs. green, 2-3 carpellate, angular and grooved

(2 carpellate flattened). 18-VII-1963, 1246 (COL, ECON, US).—2 km. SE Sibundoy. “‘Biangan borrachera’. Shrub 2 m.; leaves and calyces yellowish; corolla white. Pasture border, infreq.” 27-VIII-1963, 1348 (ECON).—1.5 km. S Sibundoy. “‘Biangan borrachera’. Tree 3.5 m.; lvs. yellowish; corolla white. Indian garden, very infreq.” 30-VIII-1963, 1356 (ECON).—1.5 km. S Sibundoy. “‘Biangan borrachera’. Tree 3 m., lvs. yellowish; flrs. pendulous, corolla white, limb recurved but teeth hanging downward, limb from base of tooth to segment edge rolled backward. Indian houseyard, very infreq.” 2-X-1963, 1431 (COL, ECON, BISH, K, PASTO, US).

2e. ‘Amarón’ n. cv. Plate LVII.

Leaves deformed, lanceolate to oblong, reaching 45 cm., margin irregularly undulate and obscurely dentate, or not vertically undulate and strongly dentate, the lateral veins curving near midrib, often forming a slight S-curve; ratio of width to length .213–.364; calyx 9.4–15.5 cm., corolla 20.3–27.8 cm., the tube relatively broad, stamens 13–18.2 cm. (including their adnation to corolla), anthers short, 28–34 mm., pistil 14–19.8 cm., fruit occasional. N=12 (*Bristol 564*).

Cv. Amarón, consisting of several clones, occurs at many localities in the Valley, sometimes in extensive hedge plantings. Probably there are in excess of 200 trees. The variable leaves may be lanceolate to narrowly oblong and with the margins both horizontally and vertically undulate and sometimes distally dentate. A few plants have both irregular leaves and leaves similar to ‘Buyés’ leaves in outline, but with the venation distorted. Most of the plants grow a little more vigorously than the other cultivars, as seen in the greater size of the trees, the leaves and fruits and in the thickness of young stems.

Common names: *Amarón borrachera*, *cucu borrachera*.

*Amarrón* (Spanish) ‘boa constrictor’, a thick, heavy-bodied snake. Possibly the name is applied to this cultivar in recognition of the very thick, young herbaceous

PLATE LVII



*Datura candida* (Pers.) Saff. (Upper) Foliage of cv. Amarón. (Lower) Emergent and open flowers of cv. Ocre.

stems which usually distinguish this from all the other cultivars.

*Cucu* was given by only one informant. The basic meaning of the word among the Sibundoy is not known to me. Spanish speakers use it in reference to 'devil' (Seijas, pers. comm.). Pazos (26), considering Quechua vocabulary in use in Colombia today, gives "Quechua, *kuku*: espantajo, fantasma", apparently 'fright, ghost'. However, Lira (23), in his exhaustive treatment of Quechua in the Inca heartland in southern Peru, gives the following: "K'UKU, adj. Inmaduro, no maduro, verde y duro, fruto verdete sin sazón. *Fam.* Divieso o quiste endurecido." The familiar application *divieso* 'furuncle, boil' and *quiste* 'cyst' is the most likely sense of the term here, for this cultivar (as well as others) has been used as a suppurant in treating boils and cysts.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. 2900–3180 m.—Road from Sibundoy to Pasto: between La María and Páramo de San Antonio. "Bush 12 ft. Fl. white." 1-VI-1946, *Schultes & Villarreal 7809* (ECON, US). Valle de Sibundoy, alt. 2200 m.—3 km. S Sibundoy. "'Amarrón borrachera'. Tree 3 m.; corolla yellow upon emergence, white expanded. Cultigen; prop. vegetatively; infrequent." 27-II-1963, *564* (COL, ECON, BISH, K, PASTO, S, US).—3 km. S Sibundoy. "Tree 6 m.; corolla emerging yellow, white expanded. Cultigen; prop. vegetatively: infrequent." 27-II-1963, *565* (COL, ECON, BISH, K, PASTO, S, US).—3 km. S Sibundoy. "Tree 3 m.; corolla emerging yellow, white expanded. Cultigen; prop. vegetatively; infrequent." 27-II-1963, *567* (COL, ECON, BISH, K, PASTO, S, US).—2 km. SW Sibundoy. "Tree 3.5 m.; corolla white. Indian garden, infreq." 14-IV-1963, *775* (ECON).—3 km. S Sibundoy. "'Amarrón borrachera'. Tree 4.5 m.; corolla white; frs. green, few. Indian garden, infreq." 10-VI-1963, *1110* (ECON).—3 km. S Sibundoy. "'Amarrón borrachera'. Tree 4 m.; corolla white; frs. green, few. Indian garden, very infreq." 2-VII-1963, *1189* (COL, ECON, US).—4 km. S Sibundoy. "'Amarrón borrachera'. Tree 2.5 m.; corolla white; fr. green. Indian garden, very infreq." 7-VII-1963, *1192* (COL, ECON, US).—Colón. "'Borrachero'. Tree 3.5 m.; corolla white, pendulous; fr. green. Border, infreq." 16-VII-1963, *1213* (COL, ECON, BISH, K, PASTO, S, US).—2 km. S Sibundoy. "'Amarrón borrachera'. Tree 3.5 m.;

corolla white. Border, infreq.” 15-VIII-1963, 1305 (COL, ECON, BISH, K, PASTO, S, US).—2 km. SE Sibundoy. “‘Cucu borrachera’. Tree 4 m.; corolla white. Indian houseyard, infreq.” 27-VIII-1963, 1346 (ECON).

2f. ‘**Salamán**’ n. cv.

Leaves long, the margins strongly undulate vertically, the distal half greatly deformed and little developed; calyx 9.9–15.1 cm., corolla 23.3–27 cm., stamens 14.8–16.9 cm. (including their adnation to corolla), anthers relatively very short, 25–28 mm., pistil 15.7–18 cm.; not known to fruit.

Cv. Salamán is perhaps the rarest of the *Datura* cultivars in the Valley. One Sibundoy owns three trees derived from a single cutting that he planted years ago; it was brought to him from just outside the Valley, where the rivers exit through a cleft in the mountains. That area is very sparsely settled today, and most of its inhabitants are not Indians. A cursory inspection of the area failed to locate any tree *Datura*.

*Common names: Salvanje borrachera* (Kamsá), *salamanga borrachera* (Inga), *salamán borrachera* (Spanish).

*Salamán* and its variants are employed by the same person, the owner of the plants, in the three languages which he speaks.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. 2200 m.—Sibundoy. “N. v. ‘Salamán-borrachero’, ‘Salvaje-borrachera’. Arbol de 4 m. Botones erectos u horizontales. Corolas blancas, aromáticas. Los indios la distinguen como especie, pero parece ser un estado intermedio entre el 2207 [not seen] y 2223 [cv. Munchira].” 12-VI-1956, *Idrobo 2224* (COL).—1.5 km. S Sibundoy. “‘Salamán borrachera’. Narcotic. Tree 5 m.; corolla white, pendulous; not fruiting. A few leaves on young, vigorous shoots are undeformed.” 11-VI-1963, 1194 (COL, ECON, BISH, K, PASTO, S, US).—1.5 km. S Sibundoy. “‘Salamán borrachera’. Tree 5 m.; corolla white, pendulous; not fruiting. Indian garden, very infreq.” 2-X-1963, 1432 (ECON).

The oldest of the three trees seen is five meters high,



about the limit for a tree *Datura*, and many of its branches have small leaves which are only two or three times longer than the diminutive leaves of 'Munchira', which are characteristically the same shape. Observing the same trees, J. M. Idrobo had already noted the resemblance to 'Munchira' (*Idrobo 2224*).

Two unusual flowers (*Bristol 1448*) were discovered on one branch of a 'Salamán' tree. They may be interpreted as chimeral in origin. They demonstrate the possibility of obtaining striking new cultivars from existing ones by vegetative propagation of such anomalous branches. The flowers are small, with all parts much shorter than normal 'Salamán' flowers, the corollas being only 21.8 and 22.5 cm. long. Most striking is the failure of the corolla limb to complete its growth and recurve. Instead, the limb flares only slightly and its margin between the teeth, rather than being rounded outward or cordate, is concave. The pistil falls far short of the stamens which in all other tree *Daturas* it exceeds.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy.—1.5 km. S Sibundoy. " 'Salamán borrachera'. Tree 4 m.; aberrant branch with 2 small flrs., corolla white, limb flaring only 45 degrees, its edges crinkled. Indian garden, very infreq." 8-X-1963, 1448 (ECON).

## 2g. 'Quinde' n. cv. Plate LVIII.

Leaves very irregular, frequently with two lateral veins and their associated laminar tissue in the basal half well developed, and the distal half with relatively less development; the flowers often somewhat smaller than in the other clones, calyx 10.3–15.6 cm., corolla 19.7–25.2 cm., stamens 13.2–15.9 cm. (including their adnation to corolla), anthers relatively short, 26–33 mm., pistil 13.1–18.1 cm.; fruit occasional, the calyx sometimes persistent. N=12 (*Bristol 327, 1304, 1433*).

Common names: *Ngunsiana borrachera*, *quinde borrachera*, *cari borrachero*.

*Ngunsiana* (Kamsá) 'hummingbird', according to a Sibundoy, from the common long-tailed hummingbird of the Valley, the tail and wings of which are represented by the leaf of this cultivar.

*Quinde* (Inga) 'hummingbird'.

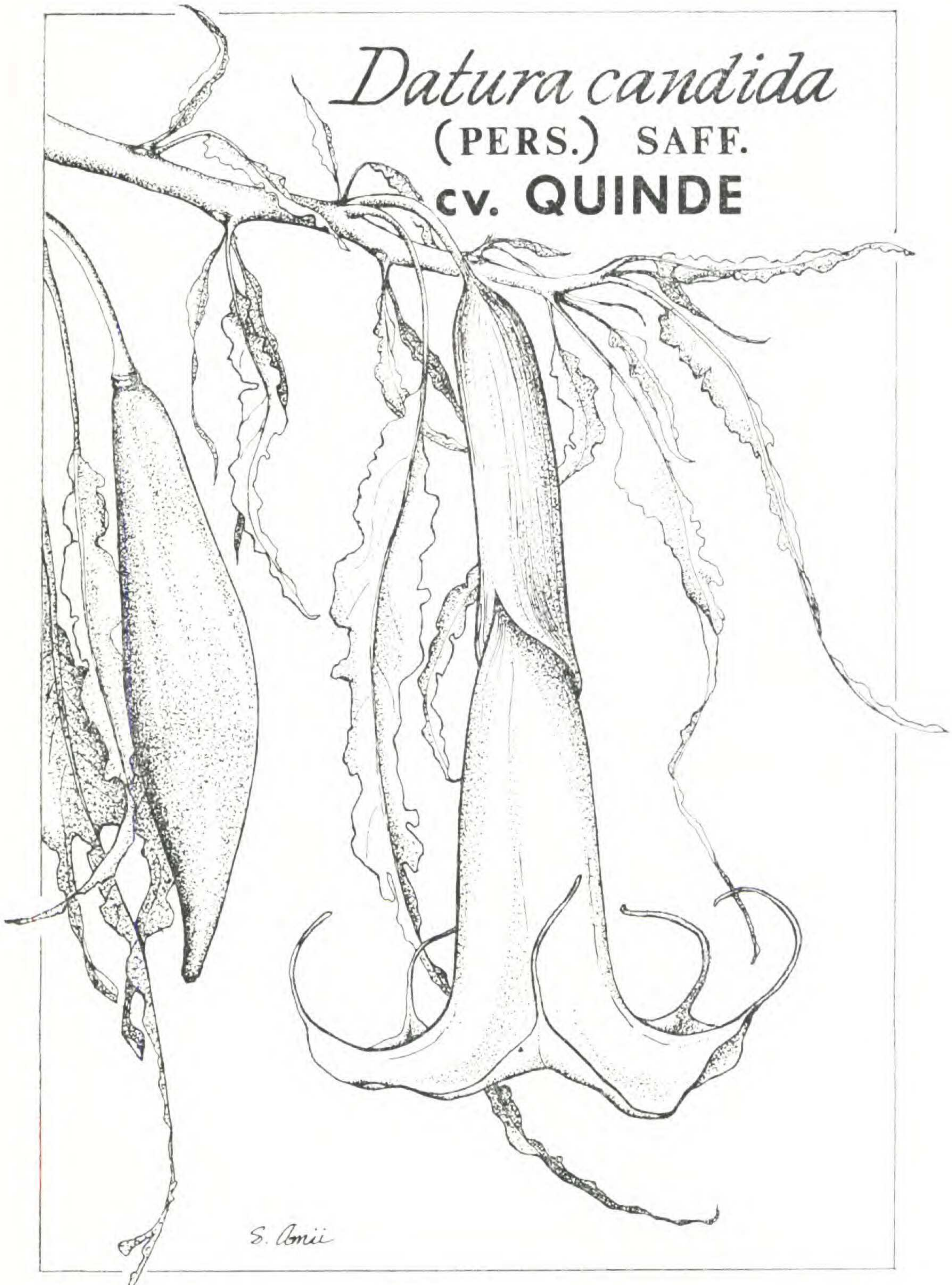
*Cari* (Inga?), apparently from KKHARI (Quechua) 'male' and familiarly, 'valiant, aggressive, energetic person' (23), suggesting one reason for the psychotropic use of this cultivar.

*Chalua borrachero*, once recorded, should perhaps be discounted, since the Quechua term CH'ALLU 'ripe' (23) may have been used by an Inga-speaking informant simply to indicate a stage of development, perhaps of the fruit.

*Quinde* and *quinde borrachera* are nearly universal terms for this cultivar.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. 2200 m.—Sibundoy. "'Borrachero' ". 25-V-1935, *García-Barriga 4640* (ECON, US).—3 km. S Sibundoy. "'Quinde borrachera'. Tree 3 m.; corolla emerging yellow, white expanded; bearing mature fruit. Cultigen; prop. vegetatively; infrequent." 27-II-1963, *566* (COL, ECON, BISH, K, PASTO, US).—4 km. SE Sibundoy. "'Quinde borrachera'. Tree 4 m.; corolla white; frs. green. Border; very infreq." 15-VI-1963, *1121* (COL, ECON, K, PASTO, S, US).—1.5 km. SW Sibundoy. "Shrub 2 m.; corolla white. Indian garden, very infreq." 12-VIII-1963, *1299* (COL, ECON, BISH, K, PASTO, S, US).—1.5 km. S Sibundoy. "'Quinde borrachera'. Tree 2.5 m.; corolla white. Indian garden, very infreq." 15-VIII-1963, *1304* (ECON).—1.5 km. W Sibundoy. "'Quinde borrachera'. Arborescent 3.5 m.; corolla white; fr. terete, green. Indian garden, very infreq." 22-VIII-1963, *1333* (ECON).—2.5 km. S Sibundoy. "'Quinde borrachera'. Shrub 2.5 m.; corolla white, pendulous; fruit green. Indian garden, very infreq." 2-X-1963, *1434* (ECON).—2.5 km. S Sibundoy. "'Quinde borrachera'. Arborescent 4 m.; corolla white, pendulous; fr. fusiform, indehiscent. Indian garden, very infreq." 2-X-1963, *1439* (ECON). Valle de Sibundoy, alt. 2500–2600 m.—2 km. NW Sibundoy. "'Quinde borrachera'. Arborescent 3.5 m.; corolla white. Secondary growth, far from any sign of dwelling. Solitary plant." 29-V-1963, *1080* (COL, ECON). 3 km. N San Pedro. "'Munchira'. Arbusto 2.5 m.; flor blanca." 9-VIII-1963, *Juajibioy Chindoy 190* (COL, ECON, US).

*Datura candida*  
(PERS.) SAFF.  
**cv. QUINDE**



*Datura candida* (Pers.) Saff. cv. Quinde. Flowering and fruiting branches,  $\times \frac{1}{2}$ .

Hernando García-Barriga collected the earliest specimen that I have seen, and I credit him as the discoverer, in 1935, of the peculiar tree *Datura* cultivars of the Sibundoy.

2h. 'Munchira' n. cv. Plates LIII, LIX.

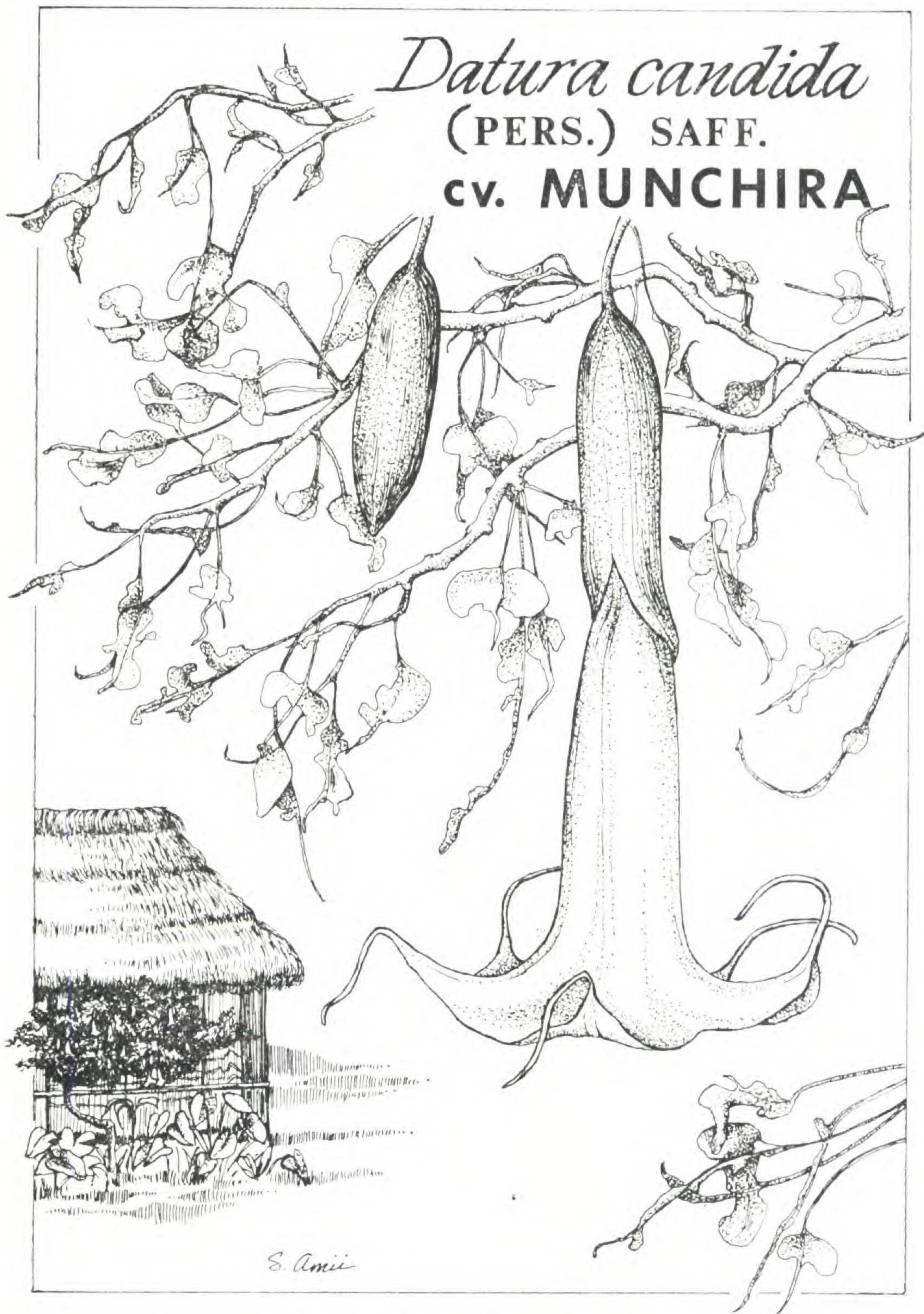
Appearing stunted, usually 1.5–2 m. high, but reaching 3 m. with age, the branches short and twisted, with scarcely elongated internodes, leaves relatively minute, variously much deformed, especially distally, calyx short, 9.3–12 cm., corolla 21.2–29 cm., stamens 15–16.7 cm. (including their adnation to corolla), anthers short, 27–30 mm., pistil 14.2–21.3 mm.; not known to fruit. N=12 (*Bristol 1268*).

These striking, stunted plants are among the rarer, for there may be no more than 15 in existence. If one of these treelets be pollarded or cut back to the ground, one or more vigorous shoots arise, as with all the cultivars, and there is no sign of stunting for several months. Perry (27) illustrated a flowering branch of this cultivar being examined by Salvador Chindoy and me (p. 335, top figure).

Common names: *Munchira borrachera*.

*Munchira* (Inga) 'caterpillar' alludes to the appearance of the leaves which seem to be (but definitely are not) *munchiradas* 'caterpillar eaten'.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. 2200 m.—Sibundoy. "N. v. 'Munchira'. Sufrutex y arbusto hasta de 2 m.; con ramas muy tortuosas; tronco principal y ramas primarias cubiertas de musgo. La atrofia en las hojas se dice que prevalece en todos los clones. Muy conocido para tomar como estupefaciente; vermifugo. Se dice que el principio es muy activo. Botones florales horizontales y pendulos." 12-VI-1956, *Idrobo 2223* (COL).—1.5 km. S Sibundoy. "'Munchira borrachera'. Narcotic. Tree 3 m.; corolla white; never fruiting. Indian dooryard, very infreq." 26-VII-1963, *1268* (COL, ECON, BISH, K, PASTO, S, US).—San Andrés. "Arborescent 1.8 m.; corolla white. Indian garden, very infreq." 20-VIII-1963, *1311* (ECON).



*Datura candida* (Pers.) Saff. cv. Munchira. Flowering branch,  $\times \frac{1}{3}$ , and habit.

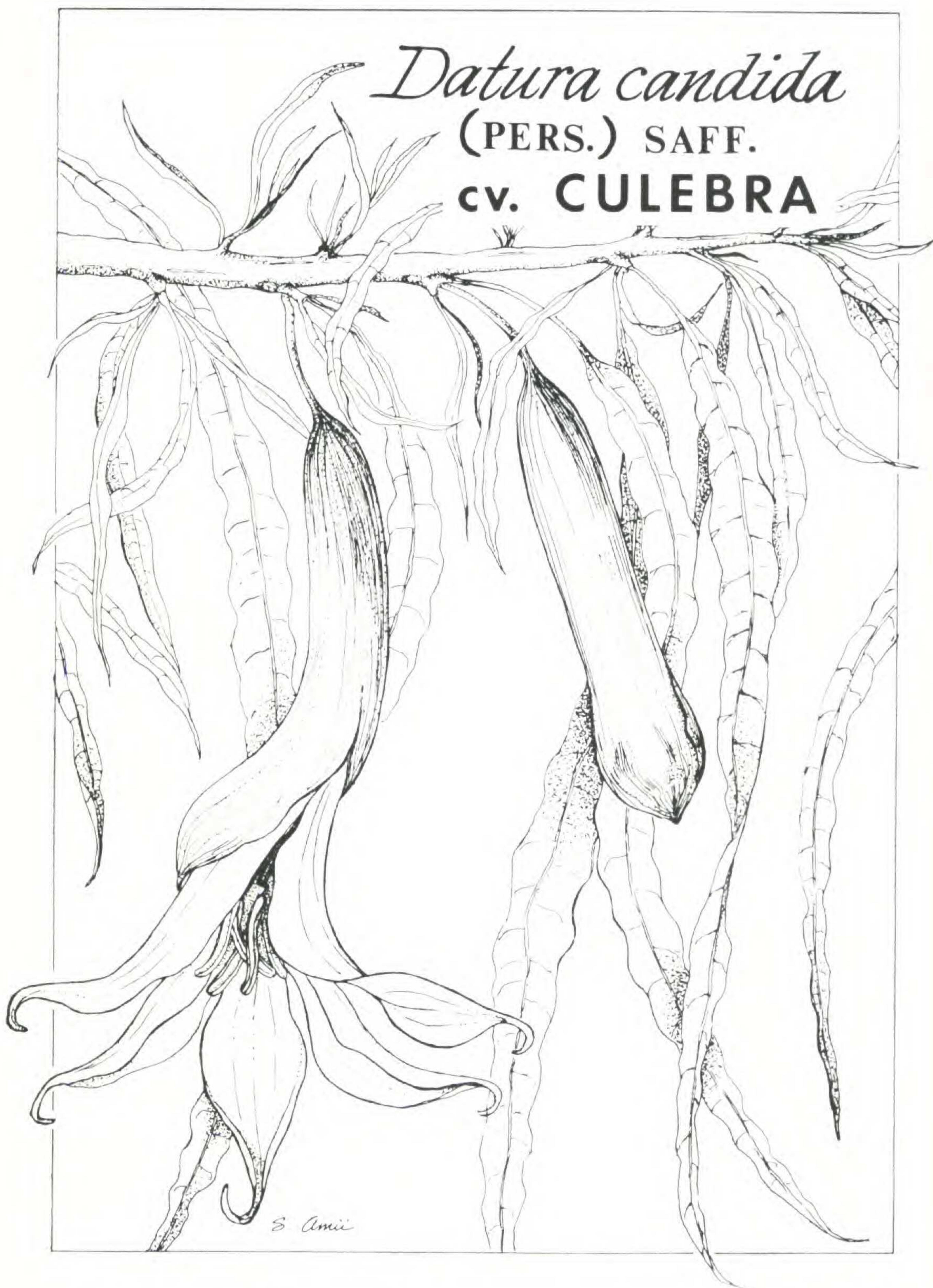
2i. 'Culebra' n. cv. Plates LX, LXI.

*Methysticodendron Amesianum* R. E. Schultes Bot. Mus. Leaflet. Harvard Univ. 17: 2. 1955.

Leaves narrowly linear-ligulate, ratio of width to length .036-.092, margin undulate; calyx distally inflated, 10.3-15.8 cm.; corolla shortest among the cultivars, 15.1-24.5 cm. (excluding the relatively short teeth), deeply divided (through  $\frac{3}{4}$  of total length) into long spatulate lobes; stamens 12-16 cm. (including their adnation to corolla), the filaments distally and irregularly contorted, anthers 25-32 mm.; pistil shortest among the cultivars, 9-12.1 cm., with a variable number (2-4) of incompletely coherent styles exceeded by the stamens, the ovary often three-locular and with one or more variably developed appendages homologous with the styles. Fruiting rarely or never. N = 12 (3, 7). (For an exhaustive and illustrated description, including details of pollen morphology, see Schultes 1955.)

While strikingly different from all other *Datura* cultivars in the Valley of Sibundoy, there is little justification for excluding cv. Culebra from the genus *Datura* (3, 5, 7, 35, 37). Aberrant forms bearing a resemblance to this one have been observed in *D. Stramonium*, and also in a single, but very distinct, tree *Datura* collection from elsewhere in Colombia (7).

The origin of 'Culebra' is unknown, but it may safely be assumed to derive from one of the white flowered tree *Daturas*, and it is tentatively placed with *D. candida*. With the exception of *Datura* 'Andrés', a putative hybrid between *D. candida* and *D. suaveolens* Humb. & Bonpl. ex Willd., all of the other white flowered cultivars in the Valley belong with *D. candida*. As with these cultivars, 'Culebra' is known only from the Valley of Sibundoy, and hence it can be considered a member of the same *D. candida* complex for the present.



*Datura candida* (Pers.) Saff. cv. Culebra. Flowering branch,  $\times \frac{1}{2}$ .

Studying material grown at Bogotá, Theilkuhl found 62.7 per cent of the flowers to be bilocular, the remainder being trilocular, a rare condition in the Solanaceae. With regard to the possible failure to form fruit, it is interesting to note that, in Bogotá, the styles “usually begin to wilt before the opening of the anthers”, thus eliminating the possibility of self fertilization (35).

Schultes recalled his lost collections of fruit as fusiform and about six inches in length, “very like the fruit of *D. suaveolens*” (29). This description, and the observations of both 2- and 3-locular ovaries suggest the fruits of *D. candida* ‘Biangán’.

The possibility of a hybrid origin cannot be eliminated, but it is clear that ‘Culebra’ is not morphologically intermediate between *D. candida* and either *D. suaveolens* or *D. sanguinea*.

Common names: *Mutseuai borrachera*, *culebra borrachera*.

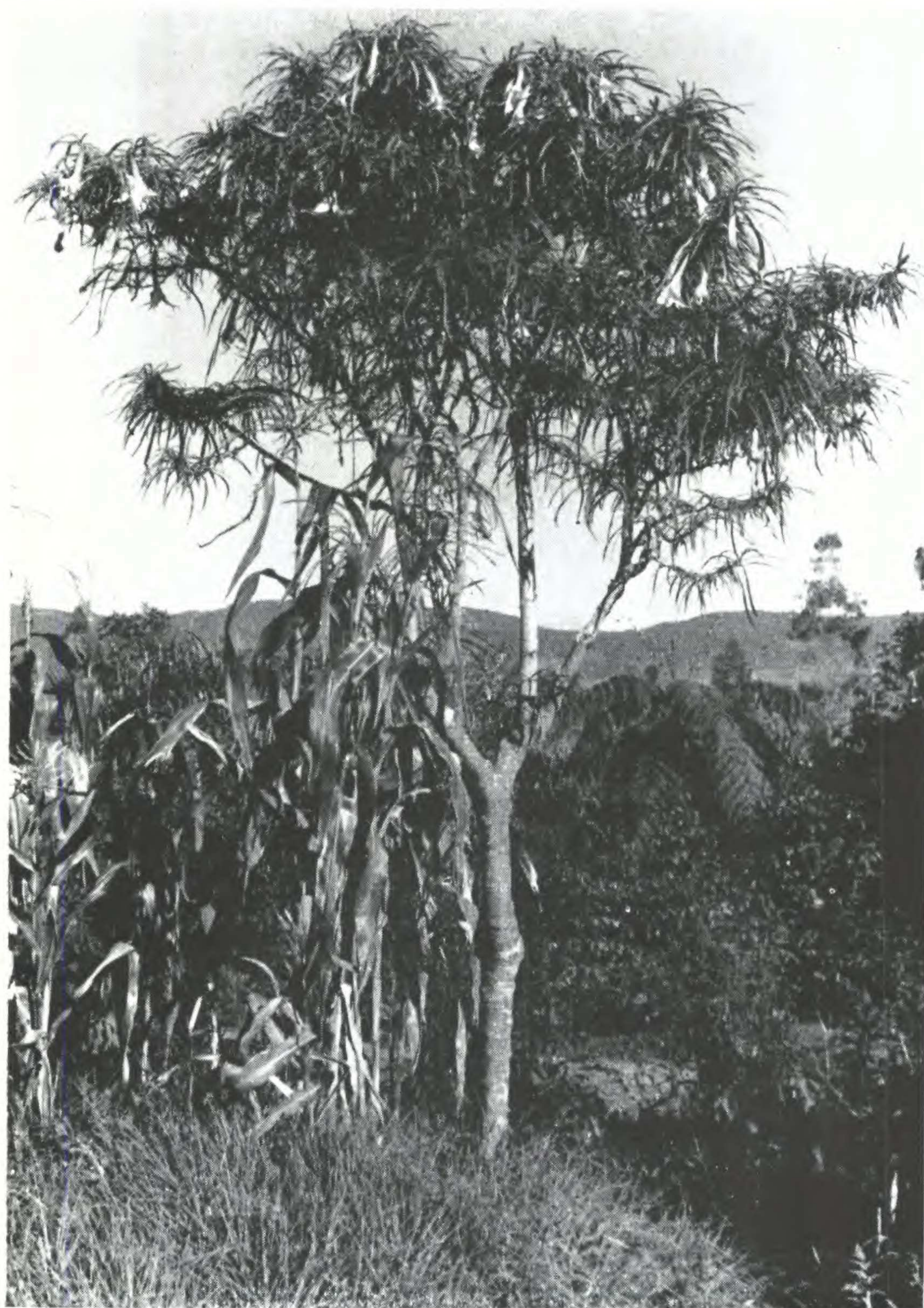
*Mutseuai* (Kamsá) and *culebra* (Spanish) mean ‘snake’, in reference to the long slender leaves.

Reports (29) of other names applicable to this cultivar arise either from uninformed natives (to many, the trees are little known though a subject of curiosity), or from misunderstandings in widely ranging conversation (informed individuals may discuss much more than the information solicited, perhaps without the interrogator’s awareness).

COLOMBIA: Comisaria del Putumayo, Valle de Sibundoy, alt. 2200 m. — Los alrededores de Sibundoy. “Nombre kamsá: kinde-borrachera. Nombre castellano: culebra borrachera. Used in Sibundoy by Kamsá Indians as a divinatory narcotic and poison.” 16-II-1942, *Schultes 3256* (COL, ECON, US). Cotype *Methysticodendron Amesianum* R.E. Schultes.) — Sibundoy. “‘Culebra borrachero’. In garden near house of an Indian herb doctor. Erect shrub 3-4 m. tall, fls. white, somewhat irregular. Plant apparently sterile, as old fls. seem to drop off, and the people say it never sets fruit. Planted here, not seen wild.” 30-III-1943, *Fosberg 20406* (US). — “Tree 20 ft. tall. Cult. in Indian



PLATE LXI



Habit of *Datura candida* (Pers.) Saff. cv. Culebra.

herb garden." 21-II-1951, *Villarreal 68* (ECON).—"N. v. 'Culebra borrachera'. Arbol de 2-2,50 m. de altura. Flores blancas. Los indios mastican sus hojas para embriagarse." 6-II-1953, *Mora 1023* (COL).—Sibundoy. "Treelet 25 feet tall. Cultivated in Indian garden. 'Culebra borrachera'. Used as a divinatory narcotic. Flowers white, anthers yellow." 30-VI-1953, *Schultes & Cabrera 20079* (GH). (Cotype *Methysticodendron Amesianum*.)—Santiago. "'Culebra borrachera'. Arbolito de 2-3 m. de alto. Flores blancas. Cultivado por los indigenas. El liquido resultante por la decocción de las hojas lo toman para alucinarse". 22-IX-1953, *Fernández 2641* (COL).—Sibundoy. "'N. v. 'Culebra-borrachero', 'Mtzkway borrachera (Kamsá). Arbusto hasta de 4 m.; muy folioso. Flores blancas, péndulas, aromáticas por la noche. Usado por médicos como narcótico, para emborracharse, para resfriados y contra hinchazones. Se reproduce solo por estacas. Se dice que rara vez da frutos, que son cilindricos, como un banano." 12-VI-1956, *Idrobo 2221* (COL).—1.5 km. S Sibundoy. "'Culebra borrachera'. Medicinal. Arborescent 3 m.; corolla white; not fruiting. Indian garden, very infreq." 13-IV-1963, 764 (COL, ECON, BISH, K, PASTO, S, US).—Sibundoy. "'Culebra borrachera'. Tree 3.5 m.; corolla white, not fragrant, emerging irregularly folded. Garden, very infreq." 26-IV-1963, 888 (ECON).—Sibundoy. "'Culebra borrachera'. Tree 3.5 m.; unopened calyx bulging at top; corolla white; filaments often bent, anthers seldom straight; no fruits. Garden, very infreq." 11-VI-1963, 1112 (COL, ECON, BISH, K, PASTO, S, US).—2 km. SW Sibundoy. "'Culebra borrachera'. Tree 4 m.; frs. pendulous, corolla white; corolla and filaments often bent irreg. Indian garden, very infreq." 19-IX-1963, 1391 (ECON).—1.5 km. S Sibundoy. "'Culebra borrachera'. Tree 3 m.; frs. pendulous, corolla white, bent. Indian garden, infreq." 21-IX-1963, 1400 (ECON)—San Francisco. "'Culebra Borrachera.' Sparsely branching, brittle shrub, 1.5-2.5 m. Flowers white. Infusion of leaves taken as hallucinogen. Found only in cultivation." 22-VIII-1964, *Olday 639* (ECON).

### *Datura* 'Andrés' n. cv.

Leaves lanceolate to narrowly elliptic, ratio of width to length .334-.443; calyx 11.6-18 cm., terminating in 2-5 lobes; corolla nearly the longest known in the genus, 31.3-43.2 cm., the slender basal part of the tube exceeding the calyx, the corolla teeth 3-5.8 cm., the limb only slightly recurved; anthers distinct, 31-36 mm., stamens very long, 25.7-31.6 cm., pistil with 1-3 pronounced

curves in the region of the anthers, exceptionally long, 32.8–39.8 cm.; not known to fruit.

Selecting seven characters which most frequently distinguish *D. candida* from *D. suaveolens*, I find that in three, the leaf shape, calyx apex and corolla tooth length, 'Andrés' is intermediate. In the length of its corolla and the conspicuous slender basal part of the tube, it is similar to *D. suaveolens*, but the calyx width and free anthers are like those of *D. candida*. The S-curved style is unique among the tree *Daturas*. There seems little alternative for the present but to interpret cv. Andrés as a hybrid between *D. candida* and *D. suaveolens*.

Common names: *Andaquí borrachera*.

*Andaquí* is the name of a now almost extinct Indian tribe to the northeast at the head of the Magdalena Valley. The area lies many days' journey away, mostly through the eastern lowlands.

On the assumption that 'Andrés' is a hybrid derivative of *D. suaveolens*, a lowland species not known to occur in the Valley of Sibundoy, it is probable that it was brought to the Valley from the eastern lowlands, or possibly directly from the Upper Magdalena area of the Andaquí people. In the immediate eastern lowland area, *Datura* is represented by several collections (*Klug 1889*, A, GH, NY, US; *Cuatrecasas 10752*, US; *Schultes 3472*, GH) which resemble 'Andrés' but have connivent anthers and lack a curved style, and thus approximate *D. suaveolens* more.

Reference to *Datura dolichocarpa* (Lagerh.) Safford in the Valley of Sibundoy (36) is probably to *D. candida* 'Andrés'.

COLOMBIA: Comisaría del Putumayo, Valle de Sibundoy, alt. 2200 m.—San Andrés. Shrub 2.5 m.; corolla white. Border, infreq. 18-III-1963, 650 (COL, ECON, PASTO, US).—San Andrés. Arborescent 3 m.; corolla white; style with S-curve in region of anthers. Roadside, infreq. 20-VIII-1963, 1314 (ECON).—2 km. SE Sibun-

doy. “‘Andaqui borrachera’. Tree 2.5 m. ; corolla pendulos, white. Indian garden, very infreq.” 10-X-1963, 1449 (ECON).

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## LITERATURE CITED

1. Avery, A.G., S. Satina and J. Rietsema. 1959. *Blakeslee: The Genus Datura*. Ronald Press, New York. xli+289 pp.
2. Barclay, A.S. 1959a. New considerations in an old genus: *Datura*. *Bot. Mus. Leaflet*, Harvard Univ. 18: 245-272. 9 illus.
3. ——. 1959b. Studies in the genus *Datura* (Solanaceae) I. Taxonomy of subgenus *Datura*. *Doct. dissert.*, Harvard Univ., Cambridge. 221 pp.
4. Bose, B.C., M.A. Matin, R. Vijayvargiya and M. Lahiry. 1966. Effect of solanaceous alkaloids on the 5-hydroxytryptamine content of rat brain. *Journ. Pharm. Pharmacol.* 18: 690.
5. Bristol, M.L. 1965. Sibundoy ethnobotany. *Doct. dissert.*, Harvard Univ., Cambridge. 361 pp.
6. ——. 1966a. The psychotropic *Banisteriopsis* among the Sibundoy of Colombia. *Bot. Mus. Leaflet*, Harvard Univ. 21: 113-140. 2 illus.
7. ——. 1966b. Notes on the species of tree *Daturas*. *Bot. Mus. Leaflet*, Harvard Univ. 21: 229-248. 4 illus.
8. ——. 1969. Sibundoy agricultural vegetation. *Proc. 37th Intn'l Congr. of Americanists, Mar del Plata*. (In press.)
9. Castellví, P. Marcelino de. 1962. Censo indolingüístico de Colombia. *Amazonia Colomb. Americanista* 6, no. 11 extra, 20-34.
10. Claus, E.P. and V.E. Tyler, Jr. 1965. *Pharmacognosy*. Lea & Febiger, Philadelphia. 5th ed. 572 pp.
11. Evans, W.C. and M. Pe Than. 1962. The alkaloids of the genus *Datura*, section *Brugmansia*. Part I. *D. cornigera* Hook. *Journ. Pharmacy and Pharmacol.* 14: 147-156.
12. Evans, W.C. and W.J. Griffin. 1963. The alkaloids of the genus *Datura*, section *Brugmansia*. Part II. New monotigloyl esters of the leaves of *D. cornigera* Hook. *Journ. Chem. Soc.* 832: 4348-4350.
13. Evans, W.C., Valerie A. Major and M. Pe Than. 1965. The alkaloids of the genus *Datura*, section *Brugmansia*. III. *Datura sanguinea* R. & P. *Planta Medica*, 13. Jahr.: 353-358.

14. Evans, W.C. and Valerie A. Major. 1966. The alkaloids of the genus *Datura*, section *Brugmansia*. Part IV. New alkaloids of *D. sanguinea* R. & P. Journ. Chem. Soc. (C), 1621-1623.
15. Gottschalk, Werner. 1954. Die Chromosomenstruktur der Solanaceen. Chromosoma 6: 539-626. Illus.
16. Heiser, Charles, Jr. 1963. Numeración cromosómica de plantas ecuatorianas. Ciencia y Naturaleza 6, no. 1: 2-6.
17. Henry, T.A. 1949. The Plant Alkaloids. Blakiston, Philadelphia. 4th ed. 804 pp.
18. Howard, Linda. 1967. Camsá phonology. MS.
19. Juajibioy Ch., Alberto. 1962. Breve estudio preliminar del grupo aborigen de Sibundoy y su lengua Kamsá en el sur de Colombia. Bol. del Inst. de Antropol. (Medellín) 2: 3-33, 9 illus.
20. Juajibioy Ch., Pedro. 1960. Datos recogidos sobre las hojas de la planta borrachera. MS., Botanical Museum, Harvard Univ., Cambridge.
21. Kahn, R.P. and R. Bartels. The Colombian *Datura* virus—a new virus in the potato virus Y group. Phytopathology. (In press.)
22. Kreig, Margaret B. 1964. Green Medicine: The search for plants that heal. . . . Rand McNally, New York. 94-96.
23. Lira, J.A. 1945. Diccionario Kkechuwa-Español. Tucumán. 1200 pp.
24. Ortiz, S.E. 1954. Estudios sobre lingüística aborigen de Colombia. Bogotá. 503 pp.
25. Pachter, I.J. and Alice F. Hopkinson. 1960. Note on the alkaloids of *Methysticodendron amesianum*. Journ. Amer. Pharm. Assoc., Sci. Ed., 49: 621-622.
26. Pazos, Arturo. 1966. Glosario de quechuismos colombianos. Imprenta del Departamento, Pasto. 147 pp.
27. Perry, Roger. 1963. The Daturas and the Valley of Sibundoy. Gardeners Chron. Gardening Illus. Nov. 4. 334-335. 5 illus.
28. Safford, W.E. 1921. Synopsis of the genus *Datura*. Journ. Wash. Acad. Sci. 11: 173-189. 3 illus.
29. Schultes, R.E. 1955. A new narcotic genus from the Amazon slope of the Colombian Andes. Bot. Mus. Leafl. Harvard Univ. 17: 1-11. 4 illus.

30. ——. 1961. Native narcotics of the New World. *Texas Journ. Pharmacy* 2: 141-167. 15 illus.
31. ——. 1963a. Hallucinogenic plants of the New World. *Harvard Rev.* 1: 18-32.
32. ——. 1963b. Botanical sources of the New World narcotics. *Psychedelic Rev.* 1: 145-166; *in The Psychedelic Reader*, University Books, New Hyde Park, 89-110 (1965).
33. ——. 1965. Ein Halbes Jahrhundert Ethnobotanik Amerikanischer Halluzinogene. *Zeit. für Arzneipfl.* 13: 125-157. 17 illus.
34. Seijas, Haydée. 1967. Sibundoy ethnomedicine. MS.
35. Theilkuhl, J.F. 1957. Introducción al estudio del *Methysticodendron Amesianum*. Dissert., Univ. Nacional, Bogotá. 67 pp.
36. Uscátegui M., Nestor. 1959. The present distribution of narcotics and stimulants amongst the Indian tribes of Colombia. *Bot. Mus. Leafl. Harvard Univ.* 18: 273-304. Map; *in Rev. Acad. Colomb.* 11: 215-228. 9 illus. (1961).
37. van Steenis, C.G.G.J. 1957. Specific and infraspecific delimitation. *Flora Malesiana*, ser. 1, vol. 5: clxvii-ccxxxiii.
38. Yepes A., Silvio. 1953. Introducción a la etnobotánica colombiana. *Publ. Soc. Colomb. Etnol.*, No. 1: 6-48.